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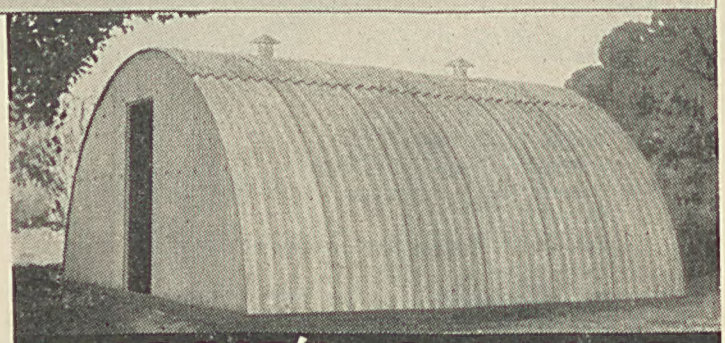

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Mallee Oat Variety Trials

Results at Walpeup Research Station

By H. J. SIMS, M.Agr.Sc.,
Manager, Mallee Research Station, Walpeup

SINCE the establishment of the Mallee Research Station in 1932, experimental work with oats has yielded much valuable information for Mallee farmers. Oats are more widely grown than is generally recognized, and now that live stock production is desired more than wheat, the area sown to this crop will increase, as oats are very useful for winter forage and conservation for future drought periods.

Oat crops in the Mallee are usually sown on stubble land, without any preliminary preparation of the soil. Under these conditions fair crops may be grown in a normal season, but it is a wise procedure, particularly if fodder reserves on the farm are low, to sow at least part of the area devoted to oats on fallow land each year.

Oats may be cut for hay, stripped for grain, or fed off to stock. The proportion of the oat crop used for each of the above purposes varies according to seasonal conditions. Oats, as hay or grain, form the most suitable fodder reserve for Mallee farmers. During the past ten years, increasing areas of oats have been sown with the object of providing feed for sheep during the winter and early spring months. For this purpose they have proved very satisfactory, as they provide more feed at that time of the year than the natural or sown pastures.

Oat Variety Trials

During the 1932-42 period, a great number of oat varieties drawn from many sources have been tested at Walpeup and the standard and accepted varieties have been established. Only Mulga, Dawn, and Algerian have maintained a place in the tests over the eleven years. New crossbreds and selections have been admitted as they reach the testing stage.

In those years in which late rains are not experienced, the early maturing varieties can be expected to give better yields than the late maturing variety, Algerian, which is now the variety occupying the largest area in the Mallee. There is little doubt that greater areas of earlier maturing varieties could be sown with advantage throughout the Mallee, especially in the more northerly parts. Also, in tests throughout the State, the new selection of Algerian, named Algeribee, has consistently outyielded its parent variety and is replacing Algerian as the standard late maturing type.

The hay yields of the varieties at present under test are given in Table I. In addition to the named varieties, the results with several of the new crossbreds are given also. All the tests are replicated and carefully designed.

In these experiments, the crops were not grazed by sheep at any stage. In all years these trials have been sown between mid-April and mid-May, regardless of soil conditions.

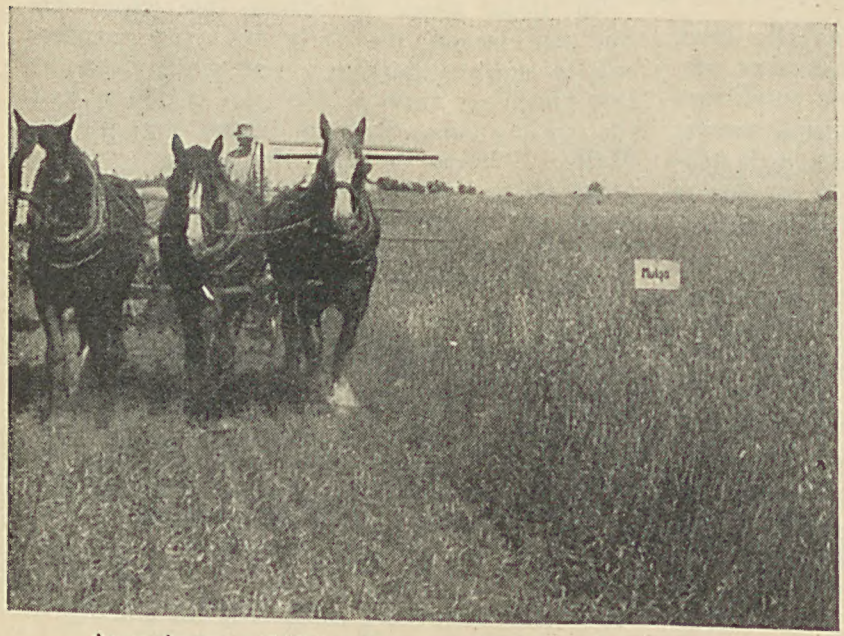
TABLE I.—OAT VARIETY TRIALS 1932-42.

Hay Yields.

Variety.	Sown on Stubble Land.			Sown on Fallow.
	Average 11 Years 1932–42.	Average 5 Years 1938–42.	Yield 1942.	Average 3 Years 1940–42.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
Dawn	22·8	19·2	15·6	30·2
Mulga	22·0	19·2	14·8	29·6
Algerian ..	21·2	18·0	14·1	25·1
Algeribee ..	..	19·4	15·1	28·0
Palestine x Dawn R4–1–1	..	18·8	13·0	27·2
Fulghum ..	..	17·8	14·2	..
Belar (new strain)	..	..	13·6	..
New Zealand Cape	..	..	14·4	..

Named varieties tested in past years include the following:—Palestine, Gidgee, Belar (old strain), Early Kherson, Burke, Guyra, Kareela, Ideal, Lachlan, Buddah, Scotch Greys, and Parker's Huskless. Some of these varieties, notably Guyra, have given good results, but have not proved superior to the standard hay varieties, viz: Mulga, Dawn, Algeribee, and Algerian.

Grain tests have been conducted for nine years and the average results show little difference between the standard varieties. The crossbred Palestine x Dawn R4-1-1 has consistently given high yields of oats, but is rather short in the straw for a general purpose variety.



An early crop of Mulga oats at the Mallee Research Station.

Many new selections and crossbreds are under test, and efforts are being made to produce a type that will withstand storms to a greater degree than existing varieties.

Results of the grain section of the plots are given in Table II.

TABLE II.—OAT VARIETY TRIAL 1934-42.

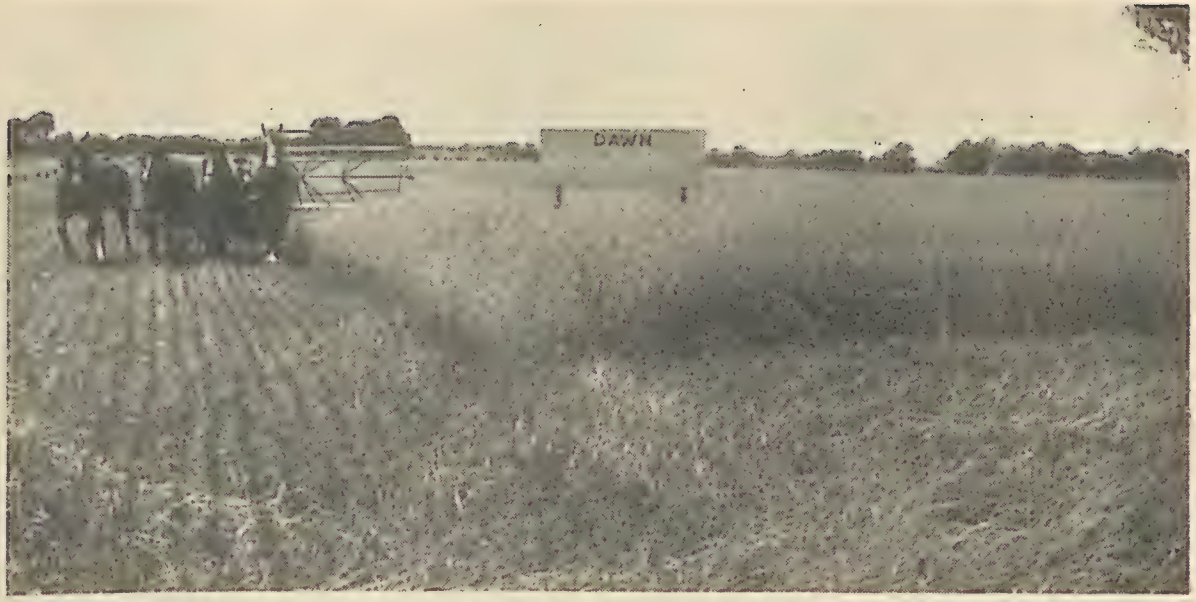
Grain Yields—Stubble Sown.

Variety.	Average Yield 9 Years, 1934–42.	Average Yield 5 Years, 1938–42.
	bus./ac.	bus./ac.
Mulga	17·4	17·2
Dawn	16·7	16·2
Algerian	16·6	16·1
Palestine x Dawn R4–1–1	..	20·2
Fulghum	..	17·2

Rate of Seeding Trials

In the earlier years at the Research Station, rate of seeding trials tested rates of 30, 50, and 70 lb. per acre, and in 1938 a rate of seeding trial was incorporated with the Variety Trial. Results of the former trials are given in Guide Books to the Station and were confirmed by the results of the recent trials given in Table III. It is now advocated that in the Northern and Central Mallee oats of all varieties intended for hay or grain should be sown at 40-50 lb. per acre, and those for grazing at 70-80 lb. per acre, the actual rate to depend on the size of the grain.

A rate of 50 lb. per acre of normal-sized grain is usually regarded as a satisfactory seeding rate for oats sown on stubble ground in the Mallee, but tests have shown a slightly increased yield with heavier sowings—70 lb. and over giving slightly higher yields, but such increase in yield approximately balances the extra amount of seed sown. Thus, for hay or grain, the heavier seeding rate is scarcely warranted. When oats are fed off by sheep in the winter in the Mallee, they seldom recover to give high yields. In the tests, the average yield was halved



Harvesting a crop of Dawn oats.

due to grazing. Nevertheless, the feed so provided for the sheep is valuable and the practice is recommended.

TABLE III.—OAT RATE OF SEEDING TRIAL.

Average Yield of Fifteen Varieties for Four Years 1938-41.

Treatment.	Hay Yield.	Grain Yield.	
		Ungrazed.	Grazed Once.
	cwt./ac.	bus./ac.	bus./ac.
25–30 lb. per acre (5½ grains per foot)	19·3	17·8	8·5
50–60 lb. per acre (11 grains per foot)	19·8	18·5	9·7
75–90 lb. per acre (16½ grains per foot)	19·9	19·0	9·8

Other detailed studies have proved that, as might be expected, much more feed is given by the heavier sowings when it is desired to feed off the crop.

Because of the upright early growth and sparse stooling habits of the early and mid-season varieties, it is natural to consider that they should be sown considerably heavier than Algerian. Tests have not substantiated this belief, as it has been found that Algerian responds to heavier seeding in much the same way as Mulga.

Manurial Trials with Oats

Tests have been sown to determine the effect of various applications of superphosphate, and "super. and ammonia" fertilizer mixtures. This experiment, which was sown with Mulga oats on wheaten stubble ground, has shown that small increases of hay can be obtained by the use of "super. and ammonia" mixtures in this district, but so far the increases have not been sufficiently large to pay for the cost of the fertilizer.

Results obtained show that the use of more than 30 to 40 lb. of superphosphate per acre with oats on stubble is not justified.

On the other hand, tests on fallow land have shown a very marked response by oats to the application of superphosphate.

TABLE IV.—OAT MANURIAL TRIAL ON FALLOW.

Treatment.	Mulga.	Algerian.
	Average 5 Years 1937–41.	Average 3 Years 1938–40.
	cwt./ac.	cwt./ac.
No Manure	26·9	18·6
Super. 30 lb. per acre ..	32·6	21·3
Super. 60 lb. per acre ..	34·4	23·3
Super. 90 lb. per acre ..	35·4	23·7

To determine if the superphosphate sown with the preceding wheat crop has any beneficial effect on stubble sown oats, plots have been

sown in each of the last five years, without manure on the site of the wheat manurial trial in the preceding year. In this manner the residual effect on oats from the application of 30, 60, 90, and 120 lb. of superphosphate to the wheat crop should be determined.

The results obtained from this trial are shown in Table V.

TABLE V.—RESIDUAL MANURIAL TRIAL.

(Oats Sown on Wheat Stubble Land)
Average Five Years 1937-41.

Treatment of Wheat in the Previous Year.	Oat Yield.
	cwt./ac.
No Manure	21·1
Super. 30 lb. per acre	22·7
Super. 60 lb. per acre	23·3
Super. 90 lb. per acre	24·0
Super. 120 lb. per acre	25·4

The results indicate that superphosphate applied with the wheat on fallow also has a beneficial effect on the subsequent stubble crop, the greater benefits being derived from the heavier dressings.

When superphosphate is rationed severely, as at present, the available fertilizer should be used on the wheat or oat crops sown on fallowed land.

Method of Sowing Trials

Oats are usually sown on land after wheat in the previous year and without any preparation of the ground, other than stubble burning. To test if extra working would be advantageous, a cultivation trial was planned. In years when opportunity presented itself, i.e., when summer rains were received, an early cultivation of a suitable number of plots in the trial was carried out. Such cultivation has resulted in greatly increased yields (as shown in Table VI). In the two years when opportunity offered, the yield was increased 50 per cent. by summer cultivation.

In 1939, the plots drilled in shallowly without any cultivation were unable to compete with the weeds, and did not provide sufficient oats to be cut for hay. In 1941, the plots drilled on the surface without previous cultivation yielded 17·8 cwt. per acre, compared with 18·0 cwt. per acre when sown with the combine. Similar results were obtained in other years. In years when the early cultivation was not possible, a cultivation was given just prior to sowing but no benefit was demonstrated by this extra working at this time of the year.

TABLE VI.—OAT CULTIVATION TRIAL.

Effect of Summer Cultivation—Results Two Years 1939 *and* 1941.

Treatment.	Yield 1939.	Yield 1941.	Average 2 Years.
	cwt./ac.	cwt./ac.	cwt./ac.
Cultivated February or March, sown with Combine	37·5	24·3	30·9
Cultivated February or March, sown with drill	29·8	25·4	27·6
No early cultivation, sown with Combine ..	22·4	18·0	20·2
No early cultivation, sown with drill	..	17·8	8·9

Oat variety plots at the Mallee Research Station.

When the ground is clean at sowing time, drilling the oats on the surface proves reasonably satisfactory. If much straw is present, drilling is the only method available to many farmers, some of whom, to get a better cover of the seed, undercut the area afterwards. Such treatment has given satisfactory yields in these plots.

Oat grazing trials have also been conducted at the Research Station, and it is intended to publish the results in a subsequent article in the *Journal*. These trials demonstrate that the varieties Mulga and Dawn are very suitable for early feed, particularly when sown heavily at 70-80 lb. per acre.

TABLE VII.—OAT METHOD OF SOWING TRIAL —AVERAGE YIELD THREE YEARS 1940-42.

Treatment.	Yield.
	cwt./ac.
Seed drilled on surface, then undercut	14·0
Seed sown with combine	10·8
Seed sown with drill	10·7

Obituary

Mr. J. T. Ramsay

We regret to announce the death on 13th December of Mr. J. T. Ramsay, Potato Expert to this Department.

Mr. Ramsay, who was 62 years of age, was born in Scotland, and gained considerable farming experience before coming to Australia 30 years ago. He succeeded the late George Seymour as Potato Expert in 1913.

During his term of office the late Mr. Ramsay did much valuable work in developing the Victorian potato-growing industry. In the course of the experimental work conducted under his supervision, the well-known standard "super-ammonia" fertilizer mixtures were evolved, and the benefits to be derived from seed selection and the planting of immature seed were demonstrated.

Prior to his death Mr. Ramsay was actively engaged in perfecting the seed certification scheme, with the introduction of which he had been closely associated.

Clean Stock Water Supply.

Many farmers do not realize the importance of a clean water supply for stock in the production of sanitary milk. Portion of the food and water a dairy cow consumes goes to body maintenance and the balance to milk production.

A clean and abundant water supply is necessary to complete the body functions. About 87 per cent. of milk is water, the balance being solids. Some cows consume up to 30 gallons of water daily, the average being from 10 to 15 gallons. Usually on a farm a dam is provided, this being cheaper than a bore with mill, tank, and storage troughs. There are many disadvantages associated with a dam inasmuch as it does not hold water permanently; the banks become broken away by stock continually wading in for a drink. As the water recedes, it is churned up by the stock and contaminated by urine and manure. Thus the water becomes polluted with organisms which are a danger to the milk supply. The cows' udders and teats are soiled with dirty, muddy water, causing additional labor in the milking sheds. If farmers are unable to afford a suitable tank storage system, it is at least advisable to fence the dam and erect a mill and ball-cock trough. This will give the stock reasonably clean drinking water and help materially in the production of clean milk.

Superphosphate

Rations for the 1942-43 Season

OWING to the war supplies of superphosphate are still further restricted, and rationing will be on a more severe basis than last year.

The standard ration of superphosphate which each consumer (except those referred to below) may purchase immediately, direct from his usual supplier, is 55 per cent. of the quantity he obtained for the period 1st January, 1942, to 30th June, 1942.

In the following cases, the ration will be assessed by the Fertilizer Section of the Department of Agriculture:—

(*a*) Farmers who, since 1st July last, have been issued a permit to purchase fertilizer for priority crops such as potatoes, vegetables, &c. Such farmers could apply to the Department for a ration of one-third of the amount normally used on non-priority crops.

(*b*) Farmers who obtained more than 20 tons of superphosphate last season from July, 1941, to June, 1942. The annual usage of such consumers varies considerably from year to year, and their ration will be assessed after study of their past purchases. The ration will be one-third of the quantity normally used per annum.

In the above cases ((*a*) and (*b*)) the ration must not be distributed by the manufacturer, agent, or distributor until the assessment by the Department is made.

Those who purchased superphosphate last season before the 1st January, 1942, may obtain, in addition to 55 per cent. of their purchases between January and June, 1942, a quota of one-third of the quantity bought by them between 1st November and 31st December, 1941, and 40 per cent. of the amount purchased in the period 1st July to 31st October, 1941. This latter quota, known as the spring 40 per cent. ration, has already been received by most consumers entitled to it.

Farmers whose rations were adjusted last season by the Department will receive their adjusted ration this year direct from their supplier. Further application to the Department is not required.

It is expected that farmers with sown-down irrigated pastures or lucerne and all bona fide dairy farmers will be able to obtain in the autumn a small supplementary ration estimated to be approximately 10 per cent. of that normally used, but dependent on the supplies then available. A special application form will be supplied later for use by such farmers. Growers of priority crops to be planted before June 30th next, e.g., flax and vegetables, may receive an additional ration to meet the full requirements of these crops.

The 55 per cent. standard ration in most cases provides farmers with a quota of one-third of the annual amount of superphosphate they have used in recent years. Any consumer who, under the above plan, would not receive his just ration of superphosphate may apply to the Fertilizer Section of the Department of Agriculture, 81 Collins-street, Melbourne, for an adjustment of his case.

As claims for adjustment of rations will take some time to finalize, farmers are advised to obtain delivery of the ration which is now available to them on application to their usual supplier. They should not wait until their claim is dealt with.

The plan provides the maximum ration available, and it is emphasized that extra rations cannot be granted on the grounds that production will be lowered.

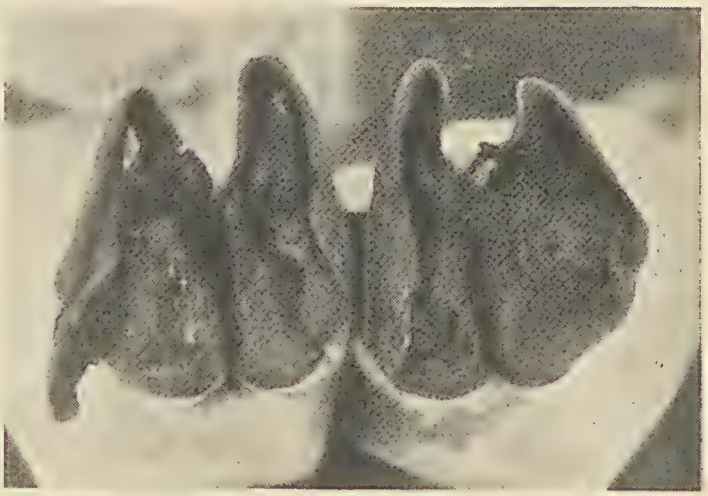
Because of labour and transport problems, it is certain that both the railway authorities and the manufacturers will have difficulty in delivering in time even the reduced quantities of superphosphate which have to be handled. It is essential, therefore, for farmers to order their rations immediately from their usual supplier, and to take delivery as soon as possible.

The usual custom of taking delivery shortly before the superphosphate is to be used cannot be adhered to.

FOOT-ROT IN SHEEP

By G. NICOL, B.V.Sc., Veterinary Officer

THE very close association of foot-rot in sheep with conditions of high humidity and rainfall has given rise to the erroneous belief that this disease is not due to any infection, but simply to maceration of the foot itself causing separation of the horn from the wall. Such a firmly held belief is difficult to dispel, but relatively recent information gained from New South Wales and Victorian experiments, coupled with fairly exhaustive field trials, indicates not only that foot-rot of sheep cannot be reproduced by simple maceration of the hoof in water, but also that it is due to an actual infection, the causal agent of this infection being a bacillus, *Fusiformis nodosus*.



An advanced case of foot-rot.
[After *Marsh & Tunnicliff*.

Where large numbers of sheep are affected, the losses caused by foot-rot are considerable, not only due to the cost of treatment, but also to loss of condition, and occasional deaths.

Cause

The painstaking work which finally led to the clarification of the cause of foot-rot is a tribute to the officers of the Council for Scientific and Industrial Research engaged on this work.

It must be realized that in any bacteriological examination of organisms occurring about the feet, one has much to contend with; not only is there an enormous amount of contaminated material about the foot and consequently many and varied species of organisms present, but also one has to appreciate that different organisms require different conditions under which to live and multiply. Hence it is not surprising that for some little time the actual organism which has since been shown to be responsible for foot-rot, eluded the search being made for a causal agent. Finally, by an alteration of the nutrients previously used for culture of those organisms which were under consideration (a horse serum being included for this purpose), a new organism which had previously eluded attempts to grow it, came to light. On further research it was found possible to reproduce cases of foot-rot with this organism. The importance of this discovery lies in the fact that, once isolated, it was possible to study this organism in greater detail, such study resulting in the discovery that this particular germ did not persist long on pastures (this period being but a matter of days), while in its natural habitat, namely the feet of sheep, it persisted for very long periods (periods in excess of three years being quite common). This was important, inasmuch as it opened up an avenue for the application of preventive measures.

Predisposing Causes

Softening of the horn which occurs during wet weather or when sheep graze for long periods on wet pastures makes an ideal condition for the infection which may ensue. Likewise, any injury to the foot itself or malformation of the foot, for example where there is an overgrowth of horn or broken hoofs, predisposes to infection.

Symptoms

Chronically affected animals are not necessarily lame, but when an outbreak begins in a flock, it is usual for slight lameness to be noted at first, becoming progressively more marked as the condition develops.

Lesions may take the form of (*a*) an inflammation of the skin between the claws or an inflammation of the fold of skin between the digits in the region of the heels, this condition often proceeding to (*b*) separation of the sole or of the hard walls of the hoof from the underlying sensitive structures.

A small amount of necrotic or dead material, greyish in colour, and with a distinct foetid odour is constantly found between the layers of separating tissues. Both claws of an infected foot are usually involved and more than one foot is commonly affected. All ages are susceptible, young sheep and lambs, even when only a few days old, being particularly susceptible.

Diagnosis

Diagnosis is based on the symptoms and lesions enumerated above.

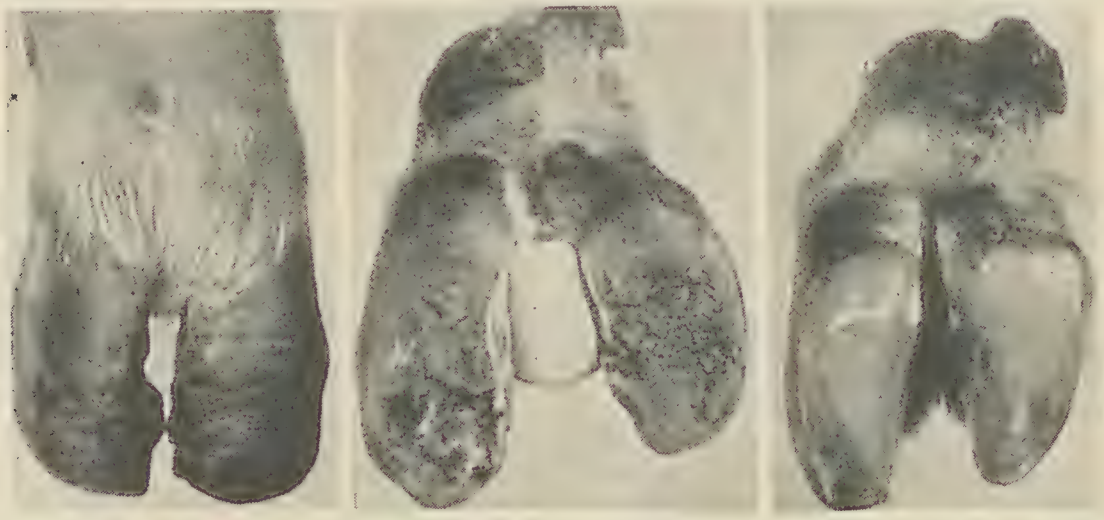
It is not correct to call all forms of foot lameness foot-rot. Conditions such as "Scald," "Lip and Leg Disease," "Dry Separation," are all separate entities. Co-existent with foot-rot in many flocks and often in the same sheep is a condition referred to as "Foot Abscess." The cause of this condition is a different organism to that of foot-rot; there is a large amount of pus formation which usually bursts out above the coronet and occasionally about the fetlock and usually older sheep only are affected; heat and pain are very evident, and there is often an involvement of tendons and ligaments.

Control

Autumn and spring are the seasons of re-infection and spread; conditions are generally too dry for the spread of foot-rot in the summer months and generally too cold for the rapid spread of the disease in the winter; sheep affected in the autumn, however, will probably all remain affected throughout the winter, while in summer many animals will recover spontaneously, but as many as 10 per cent. of an infected flock may remain as "carriers." These "carriers" may have small foci of infection under the horn which can be detected only by paring and making a close examination of the foot.

Eradication measures aim at the detection and isolation of "carriers" in the summer months. A suggested programme of control is given hereunder:—

1. Examine in summer the feet of all sheep and isolate those showing old areas of infection, superficial lesions between the digits or any signs of infection under the horn. January and February is the best time for this examination, since at this time a smaller percentage of sheep will be infected, the majority having had time to recover from a previous spring outbreak of the disease. During examination all hoofs which are mis-shapen require paring to discover any possible seat of infection. Sheep showing any lesions on the feet should be regarded with suspicion as possibly carrying the infective agent and should be isolated,



Left—Mis-shapen foot of type which often carries a focus of infection under horn. Centre—Soles of foot showing cracks and departure from normal. Right—Same foot after even paring—for this purpose a sharp pointed knife and a pair of secateurs with two cutting blades, are necessary.

[*C.S.I.R. Bull.* 140.

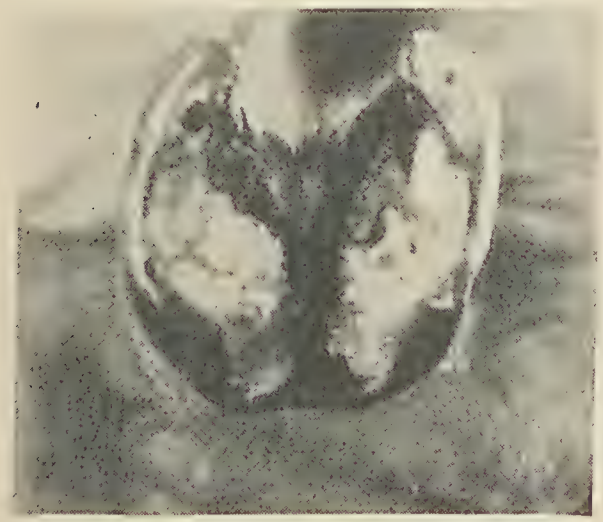
at least until the lesions have healed. Sheep which merely show separation of the outer wall from underlying healthy dry young horn need not be regarded with suspicion.

2. As an additional safeguard those not showing any indication of infection can be passed through a foot-bath of either 5 per cent. formalin or 10 per cent. copper sulphate.

3. If, at the time of examination, the flock has a large percentage of sheep still infected or with mis-shapen hoofs, it may be necessary to make two examinations with an interval of about one month between.

4. The sheep which have been eliminated during the examination should be isolated immediately. They may then be treated as described in Section 8 and returned to the flock one month after they have been completely cured; or in some cases it may be convenient to sell them for slaughter.

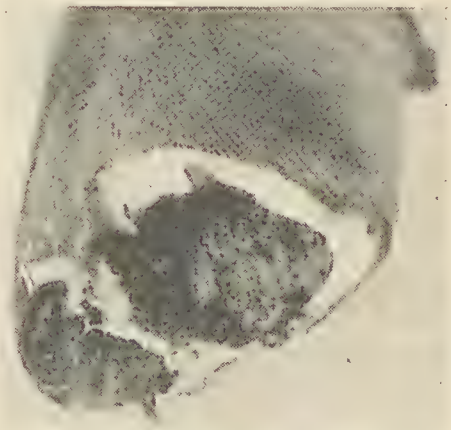
5. On non-irrigated pasture, after elimination of infected animals during the summer, sheep may be returned immediately to the same paddocks. Although some of the organisms may survive for a few days in the soil, especially around watering places, the sheep will not become infected under the conditions usually prevailing in the summer, and the infective agent will die out before conditions become favorable for the development of new cases of the disease.



Foot with horn of sole removed showing grey necrotic or dead material.

[After *Marsh & Tunnicliff.*

6. If the elimination of infected animals is done during the wet weather or during an unusual summer when the pasture is green, the paddocks should be left unstocked for two to four weeks before the "clean" sheep are put back on them.



An extensively affected foot prepared for treatment.

[After *Marsh and Tunnicliff.*

7. On irrigated pasture, paddocks should be left unstocked preferably three to four weeks before the "clean" sheep are returned to them.

8. If, on irrigated pasture, a high proportion of the flock is affected, it is often more satisfactory to dispose of the old flock, leave the pasture unstocked three to four weeks, and re-stock with sheep free of the disease; alternatively the feet of all affected sheep should be thoroughly pared and treated with 10 per cent. formalin every two to three days while unaffected ones are passed through a foot-bath of 2-5 per cent. formalin until all cases are cured or only a few are left; these latter can be isolated. When the flock has been freed from infection in this way, every two to three days the sheep should be re-examined for fresh lesions and all passed through a foot-bath of 2-5 per cent. formalin or 10 per cent. copper sulphate. After a period of two to three weeks has elapsed without any cases of foot-rot in the flock, the infection on pasture and soil will probably have died out and henceforward the flock should remain free.

9. Prevent the re-introduction of infection. In this connexion one often overlooks the fact that introduction of rams on to a property is often the source of infection of a new outbreak.

Summary

(i) Eradication of foot-rot from flocks can be successfully accomplished.

(ii) Simple maceration of the foot, such as occurs in the wet season and on improved pastures, is a predisposing cause, but not the actual cause of foot-rot.

(iii) The cause of foot-rot is a germ which does not live long apart from sheep, but may live for several years in the hoofs of "carrier" sheep.

(iv) Likely outbreaks of foot-rot should be anticipated by elimination of "carrier" sheep during the summer months of January and February.

(v) Treatment of individual cases involves extensive paring of the hoof and treatment with bluestone or formalin solutions.

(vi) Examination of introduced sheep, including rams, is necessary to prevent re-introduction of infection into "clean" flocks.

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942 issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
Reformatory Prison, Castlemaine	6.3.42	200
"Fairview" Stud Poultry Farm (M. M. and A. J. Flack), Horsham	26.3.42	927
Stewart, J. A., Castlemaine	22.4.42	592
Rushton's Electric Hatcheries, (J. Rushton), Shepparton	28.4.42	653
Christie, R. R., and Son, Bentleigh	1.5.42	719
Becker, F. W., Cheltenham	1.5.42	315
Kostos, D., cr. Collins and Waverley roads	11.5.42	801
Evans, R., 50 Simpson-street, Kyneton	11.5.42	35
Throup, R. E., Neerim South	11.5.42	200
Berry, R., Campbell's Creek	11.5.42	87
Flack, Mrs. Florence, Horsham	11.5.42	100
Need, H. G., Warragul	15.5.42	254
Smith, R. Harcourt	15.5.42	97
Dookie Agricultural College, Dookie	19.5.42	447
Pettigrove, D. N., Kennington, via Bendigo	19.5.42	558
Wohlers, S., Jung	21.5.42	139
Throup, N. C., Neerim South	21.5.42	67
Mair, W. P., Tyabb	21.5.42	38
Horsfall, J. B., Lower Templestowe	26.5.42	720
Smith, F., Terang	1.6.42	947
San Miguel, Mrs. M. H., Box Hill	1.6.42	1,503
Rae, J., Sebastopol	1.6.42	1,497
Bartlett, O. E., Pimpinio	1.6.42	228
Cakebread, H., Shady Creek, via Buln Buln	3.6.42	112
Simpson, G. D., Tally Ho	3.6.42	680
Clark, H. N. Croydon	8.6.42	1,631
Abernethy, F. J., Horsham	.42	368
Heath, A. L., Spring Vale	8.6.42	130
Lowe, L. S., Bayswater	8.6.42	241
Youl, R. S., Wedderburn	8.6.42	757
Hewett, A., Bayswater	8.6.42	247
Thomas, Mrs. J., Outtrim	8.6.42	100
Barnes, J. H., Blackburn	8.6.42	978
Wimhurst, C. J., Tongala	8.6.42	417
Williams, V. (Wangaratta Hatchery), 91 Tone-road, Wangaratta	12.6.42	568
Kosch, E. W., Minyip	12.6.42	343
Mumford, L. J., Healesville	12.6.42	252
Broadbent, C. A., Yarraberb, via Derby	12.6.42	193
Massie, G., Shepparton	12.6.42	1,309
Shipp, R., Kerang	12.6.42	375
Hopkins, C. A., Shepparton	12.6.42	1,348
Hunt, R. R., Burwood	19.6.42	300
Henderson, C. W., Shepparton East	22.6.42	247
Mitchell, B., Kangaroo Flat	22.6.42	793
Gwyther, R. P., Highton, via Geelong	22.6.42	206
Hayes, R., Montrose	26.6.42	188
Sloan, G. J., Bayswater	26.6.42	191
Everard, H. L., Hawkesdale	30.6.42	321
Ridgway, G., Noble Park	30.6.42	76
Stephenson, Mrs. K., Research	2.7.42	93
Jones, M. A., Ringwood	2.7.42	283
Major, W. R., Girgarre	2.7.42	88
Walters, Mrs. V., Lower Templestowe	2.7.42	44
Grenville Stud Poultry Farm, Springvale South	2.7.42	1,640
Coupar, J. E., Nathalia	2.7.42	487
Clegg, R. M., Hamilton	7.7.42	14
Mackintosh, Walter C., Neerim South	8.7.42	194
Hurst, H., Eltham	9.7.42	913
Jackson, C. and H., Carrum Downs	9.7.42	94
Webb, A. E. H., Cranbourne	13.7.42	1,541
Scouller, R. C., Cobden	13.7.42	100
Gibbs, A. E., Stanhope	15.7.42	623
Abikhair and Tacey, Heidelberg	15.7.42	538
All Red Poultry Farm (E. M. Nichols), Yan Yean	15.7.42	460
Peck, D., Tally Ho	15.7.42	275
Pearse, Mrs. H. F., Donald	22.7.42	232
Hockley, N., Hamilton	22.7.42	22
Everist, F. R., Tyabb	29.7.42	40
Lumsden, R. G., Ballarat	1.8.42	11
Greenwood, J., Forest Hill	1.8.42	346
Bassett, R. A., South Muckleford	4.8.42	114
State Research Farm, Werribee	11.8.42	380
Hines, W. and C. A., Traynor's Lagoon, via St. Arnaud	12.8.42	1,096
Bradstreet, J. F., Tally Ho	22.8.42	120
Maher, A. E., Wal Wale	26.8.42	666
McKinnon, Miss M., Yielima, via Nathalia	1.9.42	113
Thomas, C. H., 325 Highbury-road, Burwood	2.9.42	142
Aitken, J., Silver-street, Cheltenham	16.10.42	727
Bethell, B., High-street, Templestowe	16.10.42	632
Gregson, R., Kyvalley	16.10.42	87
Hemphill, A. E., Moneegeetta	16.10.42	401
Longerenong Agricultural College, Dooen	16.10.42	298
Mead, J. L., 28 Golf Links-avenue, Oakleigh	16.10.42	37
Nichols, W. G., Wandong	16.10.42	48
Stiles Bros., "Fair View," Wallan	16.10.42	784
Vogt, E. G., McSwain-street, Mentone	16.10.42	142
Wing Young, W., Dublin-road, East Ringwood	16.10.42	141
Batey, R. F., Invergordon South	30.10.42	822
Howard, A. P., Kyneton	4.11.42	254

Spirochaetosis or Tick Fever of Poultry

By

HAROLD E. ALBISTON, D.V.Sc.,

Director, Veterinary Research Institute, University of Melbourne

POULTRY tick is a serious and troublesome pest in some of the warmer parts of the State. In colder districts it does not thrive so well. A knowledge of its life history and habits is essential for those poultry farmers whose birds have become infested, in order that steps may be taken to stamp it out. Such knowledge is equally necessary for those whose birds are free of the pest, in order that this immunity may continue.

Ticks in various stages of growth, together with their eggs, may be found concealed in the cracks and crevices of houses and perches. The eggs are of a brownish colour, and are about one-fortieth of an inch or slightly less in diameter. The newly-hatched ticks measure about one-thirty-second of an inch long; the older ones vary in length up to about one-third of an inch. They are oval in shape, flattened, with thin edges, and are covered on the upper surface with small pits of differing sizes. Their colour varies from brownish to grey-black. They are without eyes. Breathing takes place through breathing apertures distributed throughout the body.

The eggs hatch out in from three to four weeks from the time they are laid. The newly-hatched ticks crawl on to the birds, and remain attached to the skin for a few days. They may be seen in small clusters, seemingly blue-black in colour, with their mouth parts inserted into the skin on various parts of the body. The young ticks will usually remain on a bird's body for five days or so. During this time they will get enough nourishment to sustain them for a period, and will then seek hiding places in the perches and walls.

The adult ticks have four pairs of legs, but those newly hatched have only three pairs. A moult takes place in about a week after hatching, when the fourth pair of legs appears behind the third pair. From the time of hatching three moults take place, and they reach the adult stage in about 30 days. In the adult stage, the tick visits the birds at night, and in from 20 to 45 minutes it becomes fully engorged with blood, and returns to the cracks and crevices of the houses and perches.

It is well known that poultry tick will remain alive for two years or more without recourse to the fowl for food. Indeed they have been found alive in woodwork and fences after poultry have been away from the premises for several years. It will be seen, therefore, that complete eradication of the pest, once it has become established, is extremely difficult.

The effect on birds is very severe. The ticks not only cause them great discomfort at night, and consequent loss of sleep, but may transmit spirochaetosis or tick fever.

Ticks at various stages of growth, and Eggs.
Magnified approximately 3½ times.

Red Mite

The Red Mite (*Dermanyssus avium*) is a somewhat pear-shaped small mite which is light-greyish in colour when unengorged, and from light to dark-red when engorged. These mites have four pairs of legs and a long rostrum or proboscis, and are between ½ and 1 millimetre, about the size of small pinhead in length. Their habits are similar to those of the fowl tick; they remain hidden during the day in crevices of the hen-house,

under roosts and boards, &c., where the eggs are deposited. They swarm out at night and attack the roosting fowls, although they may be found on sitting and nesting hens during the daytime in dark situations.

Red Mite.
Magnified 38 times.

The larvae (six-legged) hatch in two to six days, and moult in 24 hours, taking their first feeding of blood as nymphae. Under favorable conditions they pass through the different stages of development in ten days, although two weeks is more common. Their damage consists in—

(1) Reduction of egg production;
(2) Sitting hens leaving the eggs;
(3) Great loss of flesh, unthriftiness, and reduction of vitality; and
(4) They are carriers of Avian *Spirochaetosis* or tick fever.

Control of Fowl Tick.

If those houses which are infested are not properly constructed, or are of little value, it is better to burn them and rebuild on new ground. The ground where the old structure stood should be saturated with a strong disinfectant. It is recommended that houses in tick-infested areas be constructed of iron, with the woodwork on the outside, if possible. Angle or tee-iron should, where practicable, be used in place of wood. For economic reasons all houses should be built so that, in case of an outbreak, they can be readily dismantled. They should also be built away from any other buildings or structures. Any wood used must be carefully selected, and should be as free from cracks as possible. In any circumstances, it should be coated with hot tar.

The perches, too, should be coated with tar, and they ought to be so made that they can be easily dismantled, for it is well to remove them every now and again, as there is always the possibility of ticks finding a hiding place between the perches and the walls of the house. Perches can be suspended by wire from the roof, and metal cups, filled with a liquid disinfectant, may be soldered to each wire to prevent the tick from reaching the perches. These cups also can be fitted to most types of perches.

Pepper trees, with their loose bark, have been known to harbour large numbers of the pests. Ticks will travel along an infested fence to a new poultry house, and they and their eggs may at times be conveyed from place to place in egg-cases, crates, utensils, vehicles, and on wild birds.

A thorough inspection of the poultry farm and plant should be frequently carried out. Regular spraying with a good disinfectant such as sheep-dip will help to prevent the tick from getting a start; but, once the pests have established themselves, it is almost hopeless to expect to reach every crevice where they and their eggs are concealed. If, during the spraying process only a few specimens are missed, it will not be long before a heavy infestation occurs, for they multiply very rapidly. The joints of the perches and crevices of the surrounding woodwork should be regularly treated with sheep-dip used at full strength. The floors of the houses should be regularly and properly cleaned, and rubbish of all kind, from inside and outside, must be burned.

If proper precautions are taken, it is quite possible, in a tick-infested area, to establish a poultry farm which may be kept permanently free from the pest.

Young Tick (shortly after hatching) with three pairs of legs.
Magnified approximately 16 times.

Control of Red Mite.

The control measures adopted against red mites are directed most advantageously against

hiding places. If spraying is used, an examination of the outside of the houses may reveal the mites which migrate there when the interior is sprayed. A force spray is effective, using crude oil diluted with kerosene to make a sprayable mixture, although it leaves an oily residue. Other sprays recommended are chloride of lime (6 to 8 ounces to the gallon), and strong sheep-dip. Tar oil may be painted on the perches.

The mite is frequently introduced in contaminated chicken coops or crates, but rarely on birds. All introduced coops should be destroyed, or disinfected with boiling water or sprays. Mites will live for three to five months without food—a factor to be considered when vacant buildings are to be occupied with clean stock.

Young Ticks may be seen in small clusters on various parts of the body.

Spirochaetosis or Tick Fever

Spirochaetosis or tick fever is a disease of fowls, ducks, and geese which is due to infection with a protozoan organism known as a spirochaete. It may vary greatly in its manifestations and mortality rate. Quite frequently there will be a high death rate among affected birds, combined with a high incidence, or, on the other hand, only a few birds may become affected, and recovery is the rule rather than the exception.

The disease occurs in numerous countries, including various parts of Australia. It is commonly found in the southern parts of New South Wales, and is practically endemic in the poultry yards in the north of Victoria, especially in those districts adjacent to the River Murray. It was formerly thought not to occur in the colder parts of Victoria, south of the Dividing Range, but a number of outbreaks have been discovered near Melbourne during the past few years.

Transmission.—Although spirochaetosis may be transmitted from bird to bird by the inoculation of infective blood, the natural transmission takes place through the agency of either the fowl tick (*Argas persicus*) or the red mite (*Dermanyssus avium*).

Symptoms.

The incubation period after natural infection is seven to nine days, but this is considerably shortened in artificial infection. Most authors describe two forms of spirochaetosis, an acute and a chronic form. In the acute form, birds may actually be found dead without premonitory symptoms. More frequently, however, the affected fowls show a ruffled appearance, with a drooping head, closed eyes, and a general somnolent aspect. In rapidly-fatal cases there is a general congestion of blood vessels, and a dark comb; but, if death is delayed, jaundice, with a typical reddish-yellow colour of the comb and skin, is a reliable sign, the jaundice being a sequel to the destruction of the red blood cells by the spirochaetes.

Diarrhoea is not uncommon, the droppings being greenish or yellowish in colour, and toward the end a weakness, or even paralysis of the legs and wings, is found. The height of the disease is characterized by well-marked fever, the temperature reaching 110°–112° F. In cases where death does not occur, the temperature falls gradually, and this is coincident with the disappearance of spirochaetes from the blood stream. In the chronic form, great emaciation, anaemia, and weakness are found. Chickens show a much greater susceptibility

than grown fowls, and among them the mortality may be exceptionally high.

Recovery from an attack of spirochaetosis is followed by a well-established immunity. Fowls in a district where tick fever is common show a marked resistance to the disease, which, however, frequently makes its appearance in an acute form, when susceptible fowls from a clean district are introduced into an infected poultry yard.

Post-mortem Findings.—The commonest and most reliable post-mortem abnormality is a marked enlargement of the spleen, which shows small yellowish-white nodules throughout its substance. The liver may be enlarged and may also show small pale areas. Apart from these two organs, the other signs are those of anaemia generally with jaundice, although in acute cases a congestion of the body is found. Sometimes subcutaneous haemorrhages, resulting from tick bites, are found.

Diagnosis.—In life, the examination of blood smears taken from the peripheral circulation is usually sufficient. It frequently happens that birds are submitted for examination which have passed the crisis, and show no spirochaetes in the blood stream or body tissues. In these cases, and in the chronic form, where the spleen may actually be smaller than normal, it is usually impossible to confirm the diagnosis by laboratory methods.

Treatment.—As with many other protozoan blood diseases, Avian Spirochaetosis has been successfully treated with organic arsenic preparations. The cost of these drugs, however, precludes their use in any except the most valuable birds, and from a practical point of view it may be stated that spirochaetosis is an incurable condition.

Control Measures.

As spirochaetosis is a disease transmitted by either fowl tick or the red mite, it can readily be realized that if these parasites are eradicated there will be no possibility of poultry becoming affected with this disease. Control measures for these parasites are given earlier in this article.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen
Bowran, L. G.	"Glendare," Tallangatta
Bright, George H. ..	Dumbalk
Castle, L. H.	Clarinda
Critten, H. S.	Dumbalk
Dookie Agricultural College	Dookie
Doornbusch, John L. ..	"Starpark," Nhill
Fairchild and Clutterbuck	Tinamba
Geddes, L. D.	Bungaree
Hamblin, A. T., & Sons..	Toolleen
Harrison, C. T. ..	"Eastside" Stud, Pomborneit
Hawtin, I. E. and F. ..	"Rossmoyne," Colac
Haywood, Dr. A. R. ..	Hastings
Horn, L. A.	Leongatha North
Longerenong College ..	Dooen
Northcote Children's Farm	Bacchus Marsh
Pietsch, R. E.	Katyil
Rintoul, J. T. C. ..	Glengarry
Roy, W. A.	Morrell's Hill, via Boolarra
Spiers, Albert	Bamawm Extension
State Experiment Farm ..	Rutherglen
Sutherland, R. N. ..	Nullawill
Trenery and Soderlund ..	"Promview," Foster
Trigg, A. J.	Bungaree
Trigg, N. H.	Bullarook
Tweddle, J. T.	"Winlaton," Shepparton
Walch, M. U.	Baring

The Limitation or Control of the Spread of Mastitis in Dairy Herds

(Prepared by the Mastitis Investigation Committee
for the Australian Cattle Research Association)

THERE is still much to learn about mastitis in dairy cows. Attempts have been made to eliminate the infection from some herds, and in a proportion of cases these have been more or less successful. Even though our knowledge is incomplete, much more can be done than is being done to keep the occurrence of the disease down to a minimum.

The commonest form of the disease is the so-called chronic mastitis. This is due to the mastitis streptococcus, *Streptococcus agalactiae.*

Another common form, which appears to be most severe in young cows, is due to a staphylococcus, very much the same type of germ that causes boils in human beings.

Other forms, in which there is a very acute inflammation in the udder with general distress, are seen less commonly but sometimes they may spread rapidly to the majority of the cows in a herd. These may be due to other types of streptococci or to types of bacteria found in the bowel.

One type of mastitis may possibly be controlled by some special method, but this method may be useless for the control of other types. This leads to confusion in the minds of dairy farmers and sometimes of control officers, especially if laboratory aid in diagnosis is not available.

Recent work shows that the bacteria which commonly cause mastitis may be carried by cows which have not developed any sign of disease. These bacteria may also be present in sheds, on utensils, and possibly in yards and camping grounds. In other words, the environment may hold these bacteria which may have a chance of entering the udder at any time, but especially during milking operations.

The majority of workers believe that the bacteria enter the udder by growing up the teat canal and then progressing until they establish themselves in the milk sinuses. The evidence suggests that the infection of the teat canal takes place most commonly while the cow is in the milking shed. A small number of first-calf heifers become infected before they have ever entered the milking shed, but they form a small minority.

If we concentrate, therefore, on preventing infection of the teat canal in the milking shed we should be able to prevent the most common form of infection and, further, the method should be just as effective against the mastitis streptococcus as against the staphylococcus or the other types of bacteria which can cause mastitis.

There is one additional important point to remember. A cow affected with mastitis is carrying more of the harmful bacteria than one not affected. It can increase the number of harmful bacteria in the environment and thus increase the chance of any other cow becoming infected.

These are some of the more simple, straightforward facts that should guide us in all our attempts to control the spread of mastitis in a dairy herd.

Steps to Prevent Mastitis and Control Its Spread

1. Efficient Milking.

If the milk is withdrawn from the cow in the most efficient manner, mechanical insult to the udder is avoided and time is saved which can be employed in doing essential things properly instead of in a slap-dash manner, or not at all.

Every dairy farmer should try to understand the anatomy, the structure of the udder and how milk is secreted and "let down." Only a brief mention of some of the essential features can be made here. Each quarter is a separate unit; there is no connexion between the gland tissues of adjoining quarters. Each quarter is made up of the secreting tissue which may be compared in structure to a bunch of grapes. Each grape represents the cell in which the milk is formed. The milk then flows along the stalk or duct to a larger stalk or duct until

the main stalks or ducts empty into the collecting cavity or milk cistern which in turn leads into the teat canal. All this secreting and collecting tissue or system is supported by loose tissue containing blood vessels, nerves, and fatty tissus and special muscle fibres, like those in the wall of the gut.

Milk is being formed or secreted all the time and gradually fills all the ducts and the milk cistern. At the end of the teat a strong muscle band keeps the teat canal closed and prevents the escape of the milk. The milk can be forced out through the canal by pressure. The pressure exerted on the teat, however, is not enough if the quarter is to be milked out quickly. Something must happen; the cow must "let down" the milk. This letting down of the milk is only an increase of the pressure within the quarter itself which forces the milk from the collecting ducts into the cistern. This increase of pressure is brought about by the contraction of the muscle fibres surrounding the cells and the ducts in the gland. What forces the muscle fibres to contract? This contraction is brought about by what is called reflex action. When the calf sucks or the milker starts to milk, the nerves in the tissues send messages to the brain which in turn sends messages to a special gland which throws into the blood stream a special substance which acts on the muscle fibres in the udder and causes them to contract and to force the milk down. This action occurs quickly and passes away almost as quickly.

Cows become used to being milked, and merely to bring them into the shed starts the complex mechanism which leads to the letting down of the milk.

In order that this mechanism be used to the best advantage, to permit efficient milking, certain conditions must be observed and these are stated as follow:—

(*a*) There should be a rigid routine in the milking shed; so far as possible things should be done always in the same way and in the same order without undue delay.

(*b*) Especially there should be no delay in starting the milking after the udders have been washed or handled in any way. Don't wash the udders or handle them except immediately before starting to milk. Don't run down the line and wash the udders first and then go back to the beginning of the line and start the milking.

(*c*) The milking operation, whether by hand or by machine, should be as rapid as possible.

(*d*) The degree of vacuum at which the milking machine operates should be under efficient control. This is best provided by a weighted vacuum relief valve or by a spring loaded poppet type with covered spring. The machine should not be operated at a higher vacuum than that necessary to keep the teat-cups on and 15 inches of vacuum is recommended as the maximum. This should not be exceeded.

If this routine is carefully followed the quarters will be rapidly and completely emptied, and there will be no necessity to spend time in stripping.

After efficient milking there is no necessity to strip. The small amount of milk left in some quarters will be recovered at the next milking. If left in the quarter it will do no harm.

The physical violence of stripping, of unduly high vacuum, or of leaving the cups in position too long does harm, whereas leaving half a pound or more milk in the quarter does not.

2. Clean Methods.

If we have efficient milking we have a sound basis on which to build a system to prevent bacterial infection of the udder in the milking shed. The sheds must be kept clean and free from dust. The aim must be to have the teats clean and sterile and the teat-cups of the machine or the hands of the milkers also clean and sterile. It is easier to sterilize the teat-cups than the milkers' hands. The procedure should be as follows:—

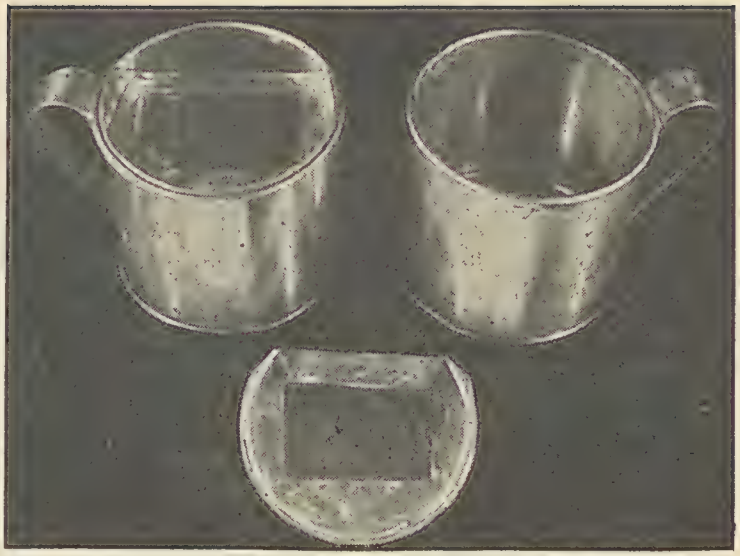
(*a*) Wash the teats with warm soapy water. Wring out the washing cloth and dry off excess moisture.

(*b*) Sterilize the teats with a solution of hypochlorite. This can be made either from powder or liquid preparations on the market. The strength of the preparation is indicated by the manufacturer in terms of available chlorine and this should be used to prepare a solution containing at most one part of chlorine to 800 parts of water or not less than one part of chlorine per 1,000 parts of water. *The solution must be made fresh at each milking* and can be applied with a cloth. Another way to apply the solution is to fill a deep (6 inches) narrow (2 to 3

inches) vessel with the solution and to dip each teat in turn into the solution which can be replaced frequently from the bulk solution kept in a bucket. Any excess fluid can be shaken from the teats; don't apply the hand or cloth in an attempt to dry.

(*c*) Place the sterilized teat-cups in position as soon as possible after sterilizing the teats.

(*d*) Between each cow the cups must be cleaned and sterilized. To clean, plunge them into a bucket of warm water containing washing soda, one heaped desertspoonful to each gallon, raise and lower them two or three times. Shake off the water and plunge the cups into a bucket of hypochlorite solution, holding them in this for ten to twenty seconds.



Strip cup for use when testing for Mastitis.

The hypochlorite solution will not sterilize a dirty or greasy surface. Therefore, the use as directed of warm soda water is essential. If the teats are sterilized and the cups are sterilized before use, it will be impossible to carry infection from one cow to another. The system must be rigidly observed. Fresh batches of warm soapy water, warm soda water, and hypochlorite solution will be required during the milking operations. This applies especially to the soapy water for the teats and the soda water for the cups. They will have to be renewed just as often as necessary, according to the number of cows. If any of these solutions become dirty they will contaminate the teats or the cups and their use will do more harm than good.

Sterilization of the teat cups can be carried out by boiling water or steam where these are available, but heat is damaging to the rubber, especially when it is in contact with the metal.

Other types of disinfectants than hypochlorite are unsatisfactory because of odour, slowness of action on bacteria or destructive action on the rubber of the cups. Potassium permanganate (Condy's crystals) has been used by some people, but it stains most objects badly, is not as good a disinfectant as hypochlorite, and manganese is regarded as a rubber poison—that is, it spoils the rubber.

In hand-milking the same principles are followed and the milker's hands are washed in soapy water and then in the hypochlorite solution between the milking of each cow.

The care and sterilization of the milking machine after each milking and the regular weekly dismantling and cleaning should be carried out according to the instruction of the dairy supervisor.

3. Handling of Cows with Mastitis.

Early recognition of disease in the udder is important. A careful watch should be kept on every quarter at each milking. Slight signs of inflammation can be detected easily enough if looked for. If a quarter is swollen and feels hot it is usually infected. Sometimes there are no signs of swelling or heat in the quarter but the milk is altered or contains clots. Clots can be detected most easily by passing the first few streams of milk through a fine wire gauze or a so-called strip cup. The use of the strip cup is strongly recommended and the test should be used on every cow once a day if possible. A strip cup made by fitting a movable strainer to a tin pannikin is shown in the illustration.

The strip cup is made by fitting a movable strainer to an ordinary tin pannikin. The brass gauze strainer, 64 mesh, is soldered over an opening in light gauge galvanized circular plate. A strip is cut from the plate to allow milk to be poured from the pannikin. To provide a shoulder, galvanized wire of 16 gauge has been soldered to a strip of galvanized iron ¼ inch deep which is soldered to the upper edge of the plate. The mounted strainer slips on and off the lip of the pannikin to permit ease of washing in water to remove any solid matter retained on the gauze after each test stripping.

Any cows showing signs of mastitis should be taken out of the line and milked last.

When purchasing cows, make sure they are free from mastitis.

4. The Handling of the Herd.

Calves and pregnant heifers should be kept as far away as possible from the milking herd.

Milking cows should have as much fresh green feed as possible at all times of the year.

When a cow is coming to the end of a lactation period and a decision is reached to dry-off the cow, cut down the food intake, then cease milking altogether and turn it out. Do not practise irregular milking to dry-off a cow. Very heavy producers may need special attention.

De-horn calves so as to lessen the injuries caused to udders by cows horning one another.

Summary of Recommendations

(*a*) Keep to a rigid routine in the milking-shed; aim at rapid and efficient milking and thus remove the necessity to strip cows.

(*b*) Provide at least four buckets for washing and sterilizing udders and teat-cups.

(*c*) Use one bucket to contain warm soapy water for washing the udders. Use another to hold a solution of hypochlorite, containing one part of chlorine to 800 parts of water.

The other two buckets are reserved for the teat-cups. One bucket will hold a solution of washing soda, one heaped dessertspoonsful to each gallon of water. The other will contain hypochlorite solution, one part of chlorine to 800 parts of water.

(*d*) Wash the udder with the soapy water and renew this solution frequently before it becomes dirty. Dry the udder with the wrung-out cloth. Sterilize the teats by washing them with or dipping them into the hypochlorite solution, but do not dry. At the end of the milking sterilize all cloths used for washing udders by boiling them in water.

(*e*) Place the clean sterilized teat-cups into position as soon as possible after sterilizing the teats. Remove the cups when ready, wash them in warm water containing washing soda, and then dip them into the hypochlorite solution for ten to twenty seconds. They are then ready to transfer to the next cow.

(*f*) For hand-milking adopt the same principles. Wash and sterilize the udder; wash and sterilize the hands between milking each cow.

(*g*) Remove any cow with mastitis from the line and milk it last.

(*h*) Purchase only healthy cows, free from mastitis.

(*i*) Keep calves and heifers away from the milking herd.

(*j*) When a cow is to be dried off, cease milking altogether; don't milk irregularly or overstock to dry-off.

(*k*) De-horn calves.

Pasture Improvement.

It is not unusual to find farmers who are unreasonably prejudiced against pasture improvement because they come up against difficulties not previously experienced. They complain that their stock are more subject to bloat, mammitis, footrot, &c., and that their pastures seem to have more weeds in them than ever before. They forget that on light, poor country the introduction of better species coupled with adequate topdressing with superphosphate has given them sufficient fodder to carry three or four times the number of stock on the same area, and that a large number of stock concentrated on a small area of succulent pastures must naturally increase the chance of spreading any disease which may occur.

Native species, while far less productive than introduced species, are hardier, being well adapted to the environment, and require little care, but careful management of an improved pasture is necessary to prevent bare patches occurring which may enable weeds to come in.

This is particularly noticeable in pastures having a big percentage of subterranean clover, because capeweed, annual grasses, and other undesirable species get a chance when the clover dies off after setting seed.

An improved pasture must not be severely grazed, should be harrowed occasionally to spread the dung, should be cut for hay only occasionally, and must be regularly topdressed, otherwise it may revert to a poorer type of pasture than the original native grass sward. But it is an indisputable fact that a well managed pasture increases the returns far in excess of expenses involved in upkeep and stock treatment.

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

PROTEIN is an essential constituent of foodstuffs, and the amount required will depend upon the type of animals being fed, and the purpose for which they are fed. For instance, all young growing animals, milking cows, animals suckling young, and laying fowls and ducks require a large proportion of protein in their diet. These live stock all require at least 15 per cent. and up to 20 per cent. of protein in their ration (dry basis). Breeding animals require rations containing about 15 per cent. of protein, while the amount of protein in the rations for working horses and fattening animals may be as low as 10 per cent., and for store stock about 7½ per cent.

Protein is essential for the repair of the tissues, the formation of new tissue in growing stock and pregnant animals, and the production of wool, milk, eggs, and all other animal products.

The foods used by animals vary considerably in their protein contents, and, of course, different animals require very different kinds of foodstuffs. However, except when there is abundant green feed available for grazing animals, or ample skim milk for calves, pigs, and poultry, rations comprised solely of home-grown fodders are frequently deficient in protein. This applies particularly in the case of milking cows, young stock, and pigs.

Fat cattle, fat sheep, working horses, and store stock usually obtain sufficient protein from the pastures and home-grown fodders.

As lambs are born when the grass is green, and fattened on the new season's growth, they usually obtain sufficient protein, but pregnant ewes often receive insufficient protein during a dry autumn, with the result that they do not make good mothers, as they provide very little milk for their lambs. A supplementary ration of good quality lucerne or clover hay, or purchased linseed nuts will provide the necessary protein.

Dairy cows tend to drop rapidly in their milk yields as soon as the grass reaches maturity, and this drop is particularly noticeable at this time of year after the harvest is completed. The reason is that the protein content of the maturing pasture decreases, and is insufficient for the cows. Good quality lucerne hay, bran, dried brewers' grains, and malt coombs are commonly fed, while meat meal, linseed meal, and polly feed are being more widely used to check this drop in yield. Half a pound of meat meal or 1 lb. of linseed meal contains as much protein as 3 lb. of bran, so that the money spent in the richer protein foods goes very much

further as far as the protein is concerned. Where available, fresh brewers' grains are a very good protein-rich food, but as they contain a large quantity of water, 8 to 10 lb. have to be fed to provide as much protein as ½ lb. meat meal, 1 lb. of linseed meal, or 3 lb. of bran. These quantities are usually sufficient for a 2-gallon cow receiving grazing and ample home-grown supplementary feed.

The protein supplement for pigs is usually provided by skim milk, and at least half, but preferably 1 gallon, should be fed to each growing pig daily. When the skim milk is not available, half a pound of meat meal should be fed to each growing pig.

Meat meal is the recommended supplement for poultry, and should comprise 10 per cent. of the mash. When available, skim milk may be used instead, and then it is usually sufficient to mix the mash with the skim milk.

THE RELATIVE FOOD VALUES OF THE PROTEIN-RICH FODDERS.

Foodstuff.	Water.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	%	%	%	1:
1. PERISHABLE AND BULKY PROTEIN-RICH FODDERS.				
Pasturage, green, succulent ..	80	14	4·5	2·3
Lucerne in early flower ..	76	9	2·5	3·2
Rape	86	6	2·0	2·3
Millet	80	9	2·5	3·0
Fresh brewers' grains ..	75	13	3·6	3·6
Skim milk ..	91	8	3·6	1·4
Butter milk ..	91	9	3·4	1·8
Lean meat, livers	75	30	18·8	..
2. CONCENTRATED PROTEIN-RICH FODDERS.				
Meat Meal ..	10	84	54·5	..
Dried butter milk	10	85	30·4	2·0
Dried separated milk ..	10	79	28·5	2·0
Linseed meal ..	11	72	25·1	2·0
Maize Gluten (Polly) feed ..	7	78	20·5	2·8
Peas, grain ..	14	69	18·2	2·8
3. SELF-BALANCED FODDERS.				
Malt coombs ..	10	45	16·0	2·5
Bran	10	44	9·9	4·5
Brewers' grains—dry	10	46	12·6	3·4
Maize oil meal ..	7	88	17·0	4·5
Lucerne hay ..	10	35	8·3	3·6
Clover hay ..	17	38	7·9	4·1

Rations containing sufficient protein are commonly termed balanced rations, and those which are balanced for milking cows, young growing stock, and breeding animals have a nutritive ratio of 1:5 or less, or, in other words, one part of digestible protein to five parts of digestible energy-producing constituents, and those for fattening, working and store stock rations with a nutritive ratio of 1:6 to 1:8.

The foregoing table gives an indication of the relative food values of the protein-rich fodders. The starch equivalent is the energy and fattening value of the food, and all animals require energy-producing food, irrespective of their protein requirements.

Dairy Cattle

In Victoria, a period of 273 days is regarded as the normal lactation period of the dairy cow, and cows are usually mated to calve every year, although, in an attempt to obtain greater butterfat records, some cows may not be bred until later in the lactation period.

At the State Research Farm, Werribee, a study of 586 Red Poll and 143 Friesian records has shown that pregnancy has had little, if any, effect on production during the 273 days' period. For instance, cows which have become pregnant within six weeks of calving have produced as much milk and butterfat as cows which have been empty during a longer portion of the lactation periods, and there is no evidence to suggest that leaving cows empty for longer lengths of time than is necessary for recalving within the year has any beneficial results. In fact, the less frequently a cow calves, the lower is her total lifetime yield of butterfat, because the act of calving is necessary for revived secretion of maximum yields.

At Wisconsin University, Chapman and Casida concluded that more production and consequently more profit resulted when cows freshen every ten and a half to eleven and a half months.

At no stage of pregnancy, up to between the seventh and eighth month, at any rate, is the milk yield of a herd of cows suddenly reduced. The tendency is for the milk yields to rise for six to eight weeks after calving and then to steadily fall until the end of the lactation, irrespective of whether the cow becomes pregnant or not.

Pigs

Pig raisers should check up on every brood sow to see if her past and prospective production warrants her being retained in the herd. Too many sows are kept until they are well on the down grade of production and then profits are diminished.

Experience has shown that the majority of sows are on the decline after having reared five litters, and as old sows can usually be cheaply replaced by gilts, it is generally sound practice to anticipate their declining production and cull them after they have reared their fifth litter.

A falling off in milk production resulting in uneven and small pigs being reared is the usual result of sows' declining production.

To have an accurate check on the performance of individual sows, it is necessary to keep written records in a book, or on cards such as those which this Department provides free of charge to pig breeders. The records, thus kept, furnish the information which cannot be accurately kept in the mind and which provides a factual basis for culling and selection of brood sows.

[L. A. Downey, H.D.A., Pig Expert.]

Table Ducks

Ducks can be raised with success on mixed farms, but are not so well adapted as fowls to supply the major source of income, and careful consideration should be given to the whole question before an attempt is made to rear ducks on a large scale. When kept in small numbers, however, ducks serve to add variety to the meat and eggs for the owner's table.

In Victoria ducks are kept chiefly for table purposes, although some poultrymen keep small flocks for egg production. Breeds suitable for table purposes are the heavy types, such as the Aylesbury, Pekin, Aylesbury and Pekin cross, and Muscovy.

Muscovy ducks have very deservedly acquired a good local reputation for table purposes. In Victoria they are kept to a much larger extent than any other breed, and are good sitters and careful mothers. They have a quiet temperament, and do not run about much, or lose condition by excessive exercise. Hence they can be kept successfully while local prices are good.

A suitable site for keeping ducks is on well-drained land, composed of light or sandy soil. There should be sufficient land for the growth of green food. Shade is essential, and the birds should be protected from the cold winds.

Houses for ducks should have sufficient ventilation, dry floors, and protection from prevailing winds. They may be built similar in design to ordinary poultry houses, a lean-to building, facing north or north-east when possible, in order that the floors may receive as much sun as possible. They should be open fronted, with a space for ventilation at the top of the back wall. This opening could be closed by means of a hinged board during unsuitable weather. If an outside run is provided, the size of the house may be estimated by allowing 2 to 3 square feet of floor space for each duck. The birds should be kept warm and comfortable at night by covering the floor with clean straw, sand, or other dry material.

The strongest ducklings are produced from eggs of well-matured, strong, vigorous stock. With the heavy breeds like the Muscovy, one drake can be mated to about three to five ducks. Ducks in breeding pens should be kept strictly to themselves, and in cold weather, comfortably housed to secure a normal egg supply. About 25 ducks in each pen is a suitable number. No hard and fast rule can be laid down as to the number of ducks that should be kept in one flock, either for breeding or other purposes, but the beginner will probably be more successful with comparatively small numbers. For egg production the breeding season for ducks usually extends from about July to September, but with heavy breeds the breeding operations may be continued throughout the year, provided foodstuffs are available and reasonably priced. The producer also would find it to his advantage if he reared his birds to mature during periods when they are in greatest demand.

Ducklings can be successfully hatched in incubators by skilled poultrymen, and also under hens and brooded in the same way as chickens, but Muscovys usually are hatched under the ducks themselves. When breeding from Muscovys, all that is necessary is to place the nest containing a little sand and litter in a convenient position, and the duck will complete her own nest. The period of hatching for Muscovys is 35 days, but for all other breeds of ducks the period is 28 days.

Muscovy ducks are best reared with the mother ducks. If good growth and health are

to be maintained, it is important that the young ducklings receive plenty of sunshine from an early age.

The principal part of all duck rations is fed as a wet mash. At the commencement, a good chick mixture, formed into a moist mash, has given satisfactory results. The following rations are recommended:—

Ingredients.	Mash Mixtures.		
	1.	2.	3.
	lb.	lb.	lb.
Ground wheat	40	30	50
Ground hulled oats ..	20	10	30
Ground maize	20	40	..
Bran	10	10	10
Dried butter milk ..	10	5	..
Meat meal	..	5	10
Common salt	½	½	½

If desired 3 lb. of bone meal may be added to the above mixtures, but, although widely advertised, the feeding of charcoal is not recommended.

In addition, ducklings should be given an ample supply of chaffed fresh green food daily. The young birds are usually fed all that they will eat four times daily, until they are two to three weeks old, and then three times daily until well grown. At four or five weeks of age they may be fed a similar ration to the mature ducks. Suitable mixtures are as follow:—

Ingredients.	Mash Mixtures.		
	1.	2.	3.
	lb.	lb.	lb.
Ground wheat or ground barley	..	30	35
Wheat pollard	40	30	..
Ground oats	20	30	35
Bran	30	..	20
Meat meal	10	10	10

Not less than 25 per cent. of chaffed succulent green food should be added to the above. Skim milk or boiled fresh meat may be used to replace the meat meal. The meat may consist of various carcasses, bullocks heads, livers, &c., and the soup from these mixed with the mash. Meat meal can be fed, when these cannot be obtained. The above mashes should be fed morning and evening.

Clean drinking water must be kept continually before the birds, and it should be placed in deep drinking vessels. If ducks are allowed to go without drinking water even for a brief period, they are likely to become overheated, and when watered, drink to excess. This may cause sickness or even death from cramp. Shell grit should be kept continually before the birds.

Pekins and Aylesburys can be marketed when they are from nine to twelve weeks old, and weigh from 4½ to 6 lb. After the age mentioned the flesh deteriorates, and their weight decreases. Muscovys should be retained until they are between fourteen and sixteen weeks old, when they should be at their best.

[H. F. Clinton, Poultry Expert.]

Bees

The red gum blossom has practically finished and many migratory apiarists will be preparing to move to an autumn flow.

Colonies on a good red gum flow should now be in great strength, giving an opportunity for an increase. Some colonies become so strong on red gum that they are a problem to shift without becoming overheated.

Some apiarists rear their queens and build up nuclei at this time from overcrowded colonies. Two frames of brood with a well-developed queen cell and bees, and two frames of stores placed in a hive body on the location of the original colony which has been moved elsewhere make a good nucleus. This can be done in the daytime as the nucleus takes the flying bees.

Well-developed queen cells should be on hand to facilitate queen replacement when using nuclei in conjunction with the honey-gathering colonies. If no increase is desired, the nucleus can be united to the parent colony in the late autumn and any worn-out queens replaced with the young queens of the nuclei. If increase is the object, the new colonies can be moved to a good autumn locality and wintered down.

As new material is almost unobtainable, all existing plant must be used to the best advantage. Many hive bodies apparently beyond repair can often be reconditioned with a little ingenuity and labour. The tool kit should contain a good nail puller, a box-scraper, and a short-pointed saw to insert into the joints to cut the nails that cannot be removed with the puller.

When the hive body is dismantled, plane off the rabbet-end on the outside of the frame rests, re-assemble with the outside in, and remove with scraper the wax film which is detrimental to painting. When re-conditioning hive bodies, it is a good plan to paint the outsides thoroughly with a dry-rot preventative.

The rabbet-ends behind the frame rests can be put in after a 2¼ inch x ½ inch board has been nailed across each end of the hive body, flush with the top of the sides. This board is essential to support the filler at the rabbet-ends, both being nailed and clamped together. It also acts as a hand grip.

Two and a half inch galvanized nails are the most durable and efficient, and should be used if procurable. They do not rust, which is an advantage, especially with red wood.

[W. A. Collins, Apiary Inspector.]

Buy a £10 National Savings Bond

Waste for Red Cross Funds

Both country and city people have a right to be proud of the splendid results of their efforts in collecting waste of all kinds and sending it to the Red Cross Waste Product Depot, 684–688 Elizabeth-street, Melbourne. Private individuals, who set themselves the task of consistently and systematically keeping their waste for Red Cross, and patriotic organizations which are responsible for its collection and despatch to the depot, are equally important in this war work.

Every day from country railway stations all over Victoria truck loads of waste arrive at the depot, always a scene of strenuous activity. By expert sorting and marketing this seemingly worthless mass of old tyres, old rags, old newsprint, waste paper, old tins, old jars and clean clippings is turned into money for Red Cross funds and at the same time is used in various industries to replace raw materials becoming increasingly scarce.

Since the depot opened in June, 1940, to the end of April, 1942, 4,990 tons of waste and 57,075 dozen bottles and tins have resulted in £25,000 being handed over to Red Cross funds.

Among the articles that have been collected and sent to the depot and then sold to be re-absorbed into industry are 3,635 tons of waste paper, which has realized £12,640; 238 tons of newsprint, realizing £2,649; and 535 tons of rags and cuttings, realizing £8,403.

There are always some special needs at the depot and at the moment these are sugar bags—10,000 are wanted every week—boot polish tins of all makes, opal jars, used for packing meat and vegetable extracts, old typewriter ribbon spools, newsprint, old rags, clean rags, and cuttings, for all of which the demand far exceeds the supply. Some of these articles are being recovered to meet the needs of manufacturers in Victoria, so that by sending them to the Red Cross, collectors are not only helping the great work of that organization; but are also helping vital industries.

All waste is carried freight free on the Victorian Railways, if it is tied securely into bundles of a reasonable size, and addressed "Red Cross, Melbourne."

Cereal Varieties Recommended

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

VICTORIAN farmers, in 1943, will sow a greatly reduced area of wheat, oats, and barley. The reasons, well known to all, are concerned principally with reduced overseas markets due to the war and shipping difficulties, the accumulation of wheat stocks in Allied countries, the severe rationing of superphosphate down to one-third of normal usage, and the shortage of man power.

The high standards of cultivation developed over many years cannot be maintained under such handicaps. It will not be possible to cultivate the fallow as is desirable under normal conditions, and, in fact, a greater percentage than usual of the crop will be sown on non-fallowed land. Whatever area is sown the most suitable varieties available should be used, for in that way the man power required to produce a given quantity of produce will be reduced and the net return to the farmer increased. Improved varieties have been produced by the Department of Agriculture in recent years, and should be made use of by every farmer able to obtain seed. In the case of wheat, the varieties recommended have been approved by the Victorian Wheat Advisory Committee, which is comprised of representatives of the Department of Agriculture, wheatgrowers, merchants, millers, and bakers, all of whom are concerned with the wheat and flour industries. Particular attention is drawn to the newer varieties Quadrat, Pindar, Magnet, and Regalia. Their use in the districts for which they are recommended will improve both the yield per acre and the general quality of the grain. Varieties not recommended should be discarded. Regarding oat varieties, the early maturing types, such as Mulga, and the midseason varieties, such as Dawn and Fulghum, should be sown on greater areas in the Mallee districts. Algeribee has proved superior to Algerian as the late maturing standard variety for all districts.

Select graded seed of the varieties shown may be obtained from the following seed distribution centres:—

Wheat

Mallee Research Station, Walpeup.—Quadrat, Pindar, Regalia, Bencubbin, Ranee 4H.

Experiment Farm, Rutherglen.—Quadrat, Baldmin.

Longerenong College, Dooen.—Quadrat, Magnet, Ranee 4H, Baldmin, Dundee, Pindar, Ghurka.

Dookie College, Dookie.—Ghurka, Baldmin, Quadrat, Magnet, Ranee 4H.

Oats

Mallee Research Station, Walpeup.—Dawn, Mulga, Algeribee.

WHEAT.

Zone.	Varieties Recommended for Grain.	
	Main Sowing.	Limited Sowing.
Wimmera (black soils) ..	**Ghurka** .. **Quadrat** ..	Magnet Baldmin
Wimmera (red soils) ..	**Ghurka** ..	Ranee 4H Quadrat Magnet Dundee Baldmin Bencubbin
Mallee (Southern) ..	**Ghurka** .. **Ranee 4H** **Regalia** ..	Pindar Bencubbin Dundee Baldmin Quadrat
Mallee (Northern) ..	**Regalia** .. **Ranee 4H** **Ghurka** **Bencubbin**	Pindar Baldmin
Mid-Northern	**Ghurka** .. **Ranee 4H**	Quadrat Pindar Bencubbin Dundee Baldmin

WHEAT—*continued.*

Zone.	Varieties Recommended for Grain.	
	Main Sowing.	Limited Sowing.
East-Northern	**Ghurka** .. **Baldmin** ..	Quadrat Magnet Ranee 4H Pindar Bencubbin
Other Districts— (Western, Central, North-Central, and Gippsland)	**Ghurka** ..	Pindar Ranee 4H Mogul

OATS.

For early maturing hay crops and winter grazing in all northern districts	Mulga (very early) Dawn or Fulghum if seed available, otherwise Guyra, Belar, or Gidgee
For general purposes in all districts	Algeribee (if seed available) or Algerian
For grain	Algeribee, Algerian
For spring sowing in late districts	Tartarian

BARLEY.

For malting.—Prior (all districts), Research (Southern and North-Eastern Districts), and Plumage Archer (late districts).

For feed and general purposes.—Cape (all districts).

Vaccination Against Fowl Pox

Warning to Poultry Keepers

Reports have reached the Department of Agriculture recently of heavy mortality occurring in poultry flocks which have been vaccinated with Fowl Pox vaccine by their owners.

Some of the deaths were due to Fowl Pox, and poultry keepers should realize that Fowl Pox vaccine is capable of producing the disease unless great care is exercised in its use.

Under no circumstances should vaccination be carried out unless an outbreak of the disease has previously occurred on the property, and birds should not be vaccinated unless they are in perfect health. Birds showing symptoms of catarrh, worms, or any other ailments, or those in poor condition, should not, on any account, be vaccinated because, if they are, some of them may develop Fowl Pox while others will die of a wasting disease, the cause of which is not completely understood, although it is definitely associated with the vaccination of unhealthy birds.

On no account should vaccination be carried out during the currency of an outbreak of the disease.

Birds should be vaccinated between the ages of 6 and 16 weeks, and all should be done at the one time.

The Agricultural Lime Act

Brands Registered for 1943

By W. C. ROBERTSON, Chemist

Section of a country lime quarry.

UNDER the *Agricultural Lime Act* 1934, agricultural lime is defined as calcium oxide (lime), calcium hydrate (water-slaked lime), or calcium carbonate (chalk, marl or ground limestone), or any material containing any one or more of these ingredients sold or intended to be used for application to the soil, but does not include any fertilizer within the meaning of the Fertilizers Act.

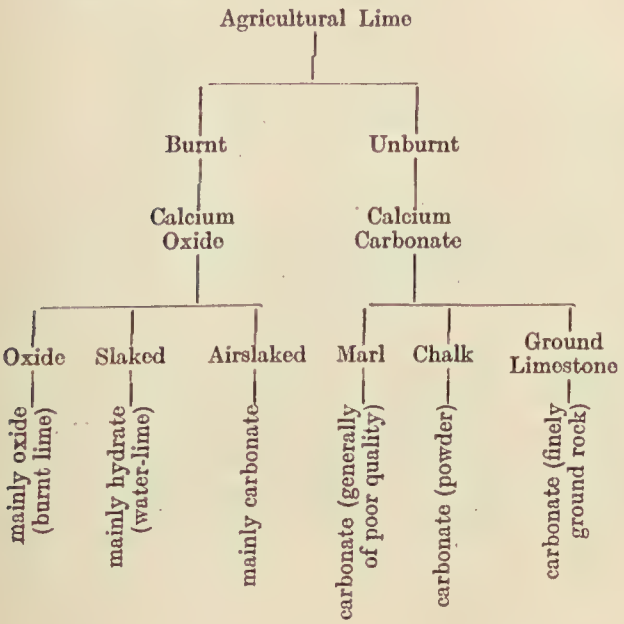
Prior to the passing of the Act the term "agricultural lime" was applied to the waste from lime kilns. Lime burners operating continuous commercial plants produce waste lime as a by-product. In works not favorably situated for marketing the by-product it is dumped, and after years of weathering, becomes converted to carbonate, i.e., chalk. In the freshly discarded by-product active lime in the form of oxide and hydrate predominates, while, in the weathered material, mild lime in the form of carbonate is most prevalent. Material of this description is the origin of the term "agricultural lime" in Victoria.

However, the term "marling" or "liming" originated from the old world practice of applying chalk or marl in extremely heavy dressings to refractory soils. In comparatively recent times, limestones both hard and soft have been ground to fine powder and sold as agricultural lime under the heading of ground limestone.

For the purpose of the user the value of agricultural lime depends upon the percentage of lime (CaO) it contains, the form in which this lime occurs, and to a lesser extent the degree of fineness. The diagram on the following page will help the reader to differentiate between agricultural lime in its various forms.

The term agricultural lime is somewhat misleading because the word lime means calcium oxide and it could be assumed that agricultural lime meant burnt lime of some description. This is not so, however. Calcium carbonate as ground limestone, marl, or chalk exists naturally; it has never been burnt and is not lime in the strictest sense of the word.

In agriculture, burnt lime in the form of oxide and/or hydrate, is regarded as "active" lime, while the carbonate as marl, chalk, or ground limestone is known as "mild" or "natural" lime.



Ground Limestone, Marl or Chalk

The carbonate is the cheapest form of lime on the market, and the average price of the five brands listed for the current year 1943 is £1 6s. 8d. per ton, with a range of 25s. to 30s.*

The average guarantee is 48·32 per cent. of lime (CaO) in the form of carbonate, with an average fineness of 81 per cent.

The quality varies from 44·8 to 51·4 per cent., and the fineness from 75 to 95 per cent. —the fineness being the portion which passes through a sieve having twenty holes to the linear inch (400 holes to the square inch).

The average cost of each 1 per cent. of calcium oxide (lime) per ton in the unburnt carbonate condition is 6·66d. To find the value per ton of ground limestone, marl, or chalk, multiply by 56 the percentage of lime, which is stated on the label attached to every bag containing the material, and discard all but the first two figures on the left which equal the value per ton in shillings.

For example: If a chalk is guaranteed to contain 45 per cent. of lime as carbonate, what is its value? The answer is—

$45 \times 56 = 2520 = 25$s. per ton.

Agricultural Slaked Lime

Agricultural slaked lime is waste lime which has become more or less air-slaked. It should contain lime mainly in the form of hydrate, but much depends upon the time which has elapsed between the date of burning and time of delivery on the farm. The average quality of the six brands registered for 1943 is 59·49 per cent. of calcium oxide (lime), with an average fineness of 75·5 per cent, the average price being 44s. per ton.

The range in quality is from 50 to 68·43 per cent. of lime, with the fineness differing between 60 and 90 per cent. The price varies from £1 13s. to £2 15s. 6d. per ton. The average cost of each 1 per cent. of lime per ton is 8·88d. This figure may be used to find the value per ton of agricultural slaked lime, by multiplying the percentage of lime which is guaranteed, by 74, and the first two figures of the answer represent the price per ton in shillings. For example, to find the value within a few pence of a brand which is guaranteed to contain 67·7 per cent. of lime mainly as hydrate or hydroxide, multiply 67·7 by 74 = 50098 = 50s. per ton.

Agricultural Ground Burnt Lime

Agricultural ground burnt lime is limestone which has been burnt in a kiln and subsequently ground to a coarse powder in a mill. The lime content should be mainly as oxide or chemical lime.

The four brands which are registered for 1943 show an average content of 82·88 per cent. of lime of an average fineness of 66 per cent., the average price being 62s. 6d. per ton. The quality varies from 80 to 87·7 per cent. of lime, the fineness from 55 to 84 per cent., and the price per ton from 58s. to 68s. The average cost per unit of lime as calcium oxide in agricultural ground burnt lime per ton is 9·05d.

To find the value of any brand of agricultural ground burnt lime, the above described method is used. That is, multiply the percentage of lime by 75 and take the first two figures of the product as the answer in shillings per ton. For example, agricultural ground

* Since this article was written approval has been given for a rise of 2s. per ton for Lilydale ground limestone, which increases the average cost to £1 7s. 1d. per ton, and the average cost of each 1 per cent. carbonate lime (CaO) to 6·73d.

burnt lime guaranteed to contain 87·7 per cent. of lime is worth 87·7 × 75 = 65775 or approximately 65s. per ton.

All prices and values are based on orders for 11-ton parcels. All figures and calculations are for the 1943 season only.

When buying lime always peruse the guarantee on the labels attached to the bags.

Ground limestone, marl, and natural chalk are not lime in the strictest sense of the word and have not been through a lime kiln, consequently, the price per ton is far less than active lime such as burnt and slaked lime.

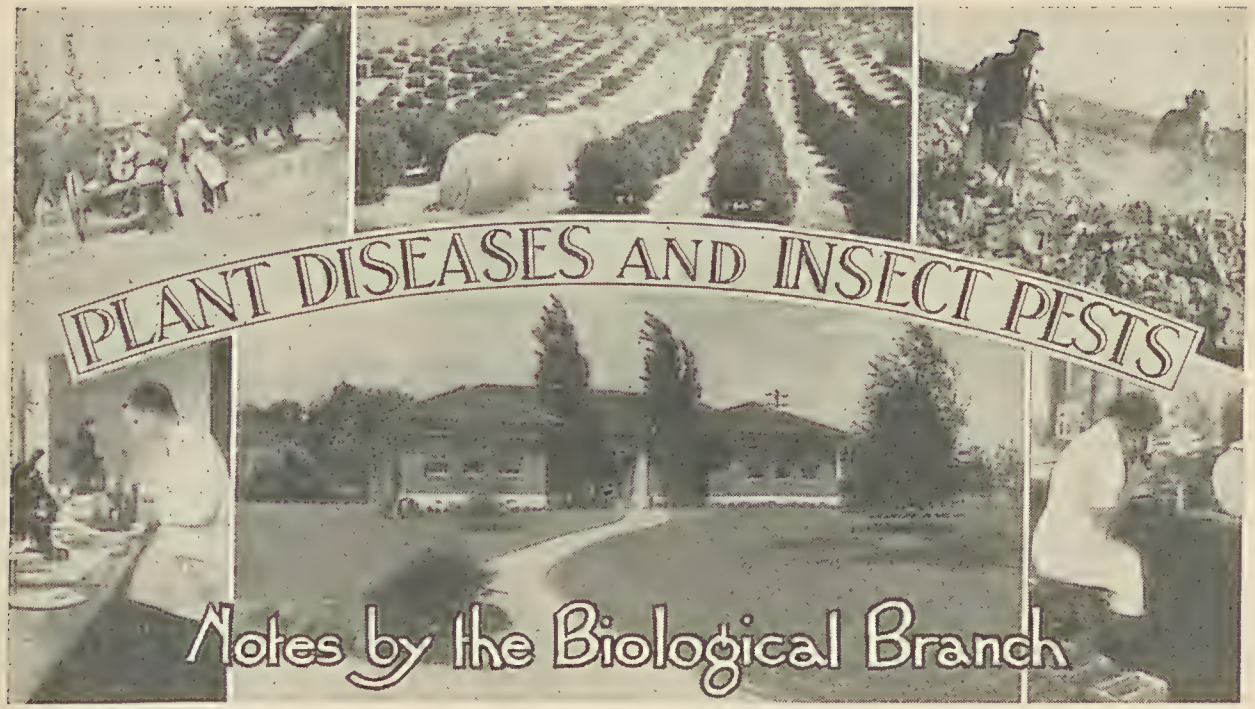
LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1943.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness. Material Passing Through a 20-mesh Sieve.	Price per Ton in 11-ton Lots.	Manufacturer.
		%		%	%		%	£ s. d.	
Agricultural Ground Burnt (unslaked)	Lilydale, No. 1	87·70	Mainly oxide	156·90	5·00	Mainly oxide	65·00	3 8 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	" No. 2	80·00	"	143·00	5·00	"	60·00	2 18 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Kurdeez ..	80·00	"	142·85	1·52	"	55·00	3 0 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne, C.1
" " "	Kawa Oxide ..	83·80	"	149·70	1·20	"	84·00	3 4 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lilydale ..	60·00	Hydroxide and carbonate	107·23	3·00	Mainly hydrate	80·00	2 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Cave Hill ..	50·00	"	89·50	5·00	"	72·00	1 13 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	White Rock ..	60·00	"	107·00	2·00	"	70·00	2 0 0	White Rock Lime Co. Pty. Ltd., 19 Queen-street, Melbourne
" " "	Snowflake ..	68·43	"	122·10	1·57	"	81·00	2 5 0	Evans Bros. Pty. Ltd., Yarra Bank-road, South Melbourne
" " "	Bulldog ..	51·80	"	92·40	·80	"	60·00	2 5 0	Bulldog Lime Co. Pty. Ltd., 344 Swan-street, Richmond, E.1
" " "	Kawa ..	66·70	"	119·10	1·20	"	90·00	2 15 6	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Ground Limestone	Lilydale ..	50·00	Carbonate	89·50	3·00	Carbonate	95·00	1 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Walker's ..	44·80	"	80·00	2·00	"	75·00	1 5 0	David Walker, Waverley Lime Works, Lara
" " "	Lara ..	45·00	"	80·00	1·50	"	80·00	1 10 0	Lara Fertiliser and Lime Co., Lara
" " "	Kurdeez No. 1	50·40	"	90·00	1·50	"	80·00	1 5 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
" " "	Kawa ..	51·40	"	91·70	1·20	"	75·00	1 8 6	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne

Melbourne, 26th November, 1942.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

DO YOUR BIT! BUY WAR SAVINGS CERTIFICATES



RING-SPOT OF CRUCIFERS

RING-SPOT, a disease of cruciferous plants, is widespread in southern Victoria.

The disease, which is caused by a fungal organism (*Mycosphaerella brassicicola*), attacks the lower leaves of cabbages, cauliflowers, and Brussel sprouts.

Although seldom of great economic importance, the disease has considerably reduced the market value of cabbages during wet seasons, in some of the heavier soil districts surrounding Melbourne.

As the name suggests, Ring-spot may be recognized by the presence on the leaves of dark-brown circular spots averaging about one-quarter to half an inch in diameter. The spots are dotted with numerous, minute, black, pimple-shaped bodies arranged in concentric rings, which contain the spores of the fungus.

The disease, even when severe, seldom causes any great reduction in yield, but it spoils the market appearance of cabbages and cauliflowers.

Most of the cabbage, cauliflower, and Brussel sprout seed crops inspected this season have been infected, sometimes severely, with Ring-spot, causing a reduction in seed yield. The fungus produces purplish-black streaks on the seed-stalks and irregular, elongated spots of the same colour, on the seed pods.

As the disease is seed-borne, growers are advised to treat their seed with hot water, which is also effective for the control of other seed-borne diseases of cruciferous crops, such as Blackleg and Black Rot.

Seed should be tied loosely in cheesecloth, and immersed for 30 minutes in water at a temperature of 122 deg. F. The water should be kept continuously agitated. At the conclusion of the treatment, the seed should be plunged into cold water for five or ten minutes and then spread out to dry.

It is not necessary to have expensive equipment to treat seed by this method, but it is necessary to have an accurate Fahrenheit thermometer.

A simple water bath may be prepared by enclosing a kerosene tin or small oil drum in a wooden box and packing the air space between the tin and the box with sawdust, or some other insulating material.

The bath should be filled with water at a higher temperature than the one required (122 deg. F.) and allowed to cool with frequent stirring, until the correct temperature is reached, when the seed may be introduced. The temperature of the bath may be adjusted

Ring-spot disease of cabbage.

from time to time during the treatment period by the addition of boiling water, stirring vigorously at the same time, care being taken not to pour it directly on the seed.

This treatment is very effective for the control of cruciferous diseases in the seed bed, but it will cause a certain reduction in the germinability of the seed—particularly of seed several years old. For this reason it is always advisable to first treat a small amount and carry out a germination test with a hundred seeds before treating a bulk lot.

Two of these organisms may also produce serious foot-rots, if weather conditions are favorable for disease development.

The foliage symptons of the three diseases are somewhat similar in appearance, but display considerable variation, according to the variety affected, and the weather conditions prevailing during the growing period of the crop.

Septoria Leaf Blotch is also caused by a fungal parasite (*Septoria pisi*), which produces indefinite yellowish-brown blotches, resulting in the death of the lower leaves and stipules. In the dead leaf tissue, a large number of minute black dots are produced—the fruiting bodies of the fungus which contain masses of fungal spores.

Ascochyta Blight is the most serious and widespread of the two diseases.

Both diseases are favored by cool, wet, growing conditions, and the possibility of heavy seed infection in some districts, this season, must not be overlooked.

If young plants become infected—usually due to the sowing of infected seed—a total crop failure may result.

ASCOCHYTA BLIGHT AND SEPTORIA LEAF-BLOTCH OF PEAS

Commercial growers or home gardeners who make a practice of saving their own pea seed should examine their crops carefully this season for the presence of Ascochyta Blight or Septoria Leaf-Blotch. It would be most foolhardy to save seed from an infected crop, particularly if either of these diseases were present in an epidemic form.

The name, Ascochyta Blight, refers collectively to the diseases caused by a group of three closely related fungal parasites, which produce distinct leaf and pod spots on the pea plant.

Ascochyta Blight of peas. Note two types of foliage lesions.

Thus, for the control of these diseases, the main emphasis must be placed on the selection of disease-free seed. Other control measures are supplementary in nature, and include a rotation of at least three years and the destruction of diseased vines by raking into heaps and burning.

Chemical seed treatments are ineffective in preventing the development of foliage symptoms, but some organic mercurial compounds will reduce the amount of foot-rot present, in seasons favorable for disease development.

ONION MILDEW

Weather conditions have been very favorable this season for the development of onion mildew, which has occurred in an epidemic form in many parts of the State.

The disease has been particularly severe in metropolitan market gardens, where onions are planted three rows to the land, 6 inches apart in the rows, and forced with nitrogenous fertilizers such as blood, resulting in a very dense succulent growth with poor air circulation around the plants.

The organism causing this disease (*Peronospora destructor*) over-winters on the seed, in the soil, on crop refuse, and on over-wintering plants.

Infection may occur at any stage in the life of the plant, but seedlings are usually free from the disease, as the environmental conditions necessary for the development of the fungus seldom occur before late spring or early summer.

The disease usually makes its first appearance during a period of humid, relatively cool weather. The fungus appears on the surfaces of the leaves as a violet-grey furry growth. Eventually, the infected leaves collapse, turn yellow and die.

If a period of dry weather follows an outbreak, the disease will disappear and affected plants will make new growth, but on the return of damp conditions the new growth, in turn, will become infected. A repetition of this state of affairs will result in a considerable reduction in yield.

Infection of seed plants results in the production of circular or elliptical lesions on the seed stalks. During a protracted period of moist weather, great loss of seed may occur, owing to the girdling and eventual collapse of infected stalks, with the subsequent death of the seed heads.

Onion plant infected with mildew.

Effective measures have yet to be devised for the control of this disease. The waxy foliage of the onion prevents the application of a uniform spray deposit of Bordeaux mixture, which is effective in the control of mildews on other plants.

If this problem can eventually be overcome by the addition of suitable spreaders or stickers, there is still the problem of frequent applications, to keep pace with the almost continuous emergence of new growth.

Efforts should be made, however, to reduce the severity of the disease by regulating the environmental conditions favorable for disease development. Avoid growing onions in low-lying areas sheltered by hedges or break-winds. Wide spacing and exposure to the prevailing winds, enables the rapid drying of the onion foliage after rain, and the subsequent death of the fungal spores.

Destruction, by burning, of infected crop refuse, and rotation, also assist by reducing the spore load in the soil.

PUMPKIN BEETLE

The Pumpkin Beetle (*Aulacophora hilaris* Bois), attacks all members of the pumpkin family—pumpkins, melons, squashes, and cucumbers being chiefly attacked.

The most serious damage occurs to young plants, especially those just through the ground, which may be killed outright, but, in older plants, the damage is primarily confined to the leaves. Once the plants are making active runners, however, they are usually able to outgrow the infestation. The beetles may also attack the young flowers and forming fruits of squashes and pumpkins, thus causing additional losses.

The beetle itself measures about a quarter of an inch in length, is of a general orange-yellow colour, with four large black spots on the back. It is frequently confused with the common beneficial ladybird, but its elongated shape readily distinguishes it from the more circular ladybird.

For control of this pest on young plants, dusting with either hydrated lime or a mixture of equal parts of lime and tobacco dust is recommended. It will be necessary to repeat this treatment at regular intervals, or until the plants outgrow the trouble. On older plants, dusting with a 25 per cent. arsenate of lead dust, or spraying with arsenate of lead mixture, 1 lb. of arsenate of lead paste to 16 gallons of water is recommended.

The pumpkin beetle and a damaged leaf.

MOSQUITOES

While in certain parts of Australia, mosquitoes are notorious for the part they play in the transmission of such human diseases as malaria and dengue fever, in Victoria they are chiefly of importance because of their nuisance and annoyance characters.

In mosquito control, the first essential to bear in mind is that all mosquitoes in the first instance depend on water, perhaps only a small quantity, for breeding purposes. Therefore, the ultimate destruction or reduction in numbers of a mosquito population hinges on this factor, and any other measures that have to be taken are, in actual fact, secondary to this main consideration.

Mosquito control can be considered under three main headings:—

(*a*) elimination or destruction of breeding grounds,
(*b*) destruction of the adult mosquitoes,
(*c*) prevention of, or protection against, mosquito attack.

(a) Elimination or destruction of breeding grounds

This work can be accomplished in a large number of ways depending on the particular circumstances of each case. For example drainage of swamps and the filling in of areas where water occasionally collects are very important in community efforts. In water tanks and areas of water not able to be treated in the above way, oiling is recommended. A mixture of crude oil and kerosene in equal parts should be used, using 1 oz. of this mixture to 15 square feet of surface. This will prevent the mosquito wrigglers from breeding in those particular places.

(b) Destruction of adult mosquitoes

Destruction of adult mosquitoes can be most successfully carried out by the use of liquid pyrethrum fly sprays. Such spraying must be thoroughly carried out so that the whole of a room is saturated with spray, and a fine mist left in the room.

(c) Prevention or protection against mosquito attack

For protection against mosquito attack, use either screening or repellent mixtures. Screening can be used either for persons or for whole buildings. In the case of persons, particularly in malarial areas, special garments are worn. At night, the surest protection is a good bed

net. There are many types in use, but in order to be serviceable and at the same time comfortable, the net should be roomy and hung in such a way as to be stretched tightly in every direction.

Of the repellent mixtures, citronella oil is mostly used as the base of every mixture. Two mixtures which have given satisfactory results are:—

1. Bamber oil, which consists of the following:—

Citronella oil	.. ..	1½ parts,
Kerosene	.. ..	1 part,
Coconut oil	.. ..	2 parts,

made up with 1 per cent. carbolic acid as a preservative.

2. Vaseline	.. .. ..	2 oz.,
Citronella oil	.. ..	½ oz.,
Spirits of camphor	.. ..	¼ oz.,
Cedar wood oil	.. ..	¼ oz.

Either of these mixtures should be smeared over the exposed skin, but as their repellent properties are only temporary, and seldom completely effective, their use should be regarded as only supplementary to other measures.

POTATO MOTH

As the potato moth (*Phthorimaea operculella* Zell.), in certain seasons may cause losses of up to 60 per cent. of early potato crops, and from 25 to 40 per cent. in mid-season or late crops, all measures which will reduce these losses to a minimum should be taken.

The measures to be taken can be summarized as follows:—

(*a*) *Moulding.*—Moulding of crops should be carefully carried out to protect the tubers forming underground. With the variety Up-to-date, which normally produces its tubers close to the surface, such mouldings should be carefully carried out and need to be wide and shallow rather than high and narrow ones.

(*b*) *Digging.*—After digging, bag the potatoes as soon as possible. The practice of placing a fork of dried haulms on top of the sewn or unsewn bags is a bad one. It is much better to sew the bag at once, and turn it upside down.

Top—Bagged potatoes covered with potato tops (a bad practice). Lower—Bagged potatoes, sewn at once and inverted (a good practice).

(*c*) Remove the bagged potatoes from the paddock as soon as possible after digging.

(*d*) Protect potatoes being kept for seed by spraying them with tuberol.

SNAILS AND SLUGS

Now that meta fuel tablets and prepared baits containing meta are becoming increasingly difficult to procure, it will be necessary to resort to an alternative method of control.

A poison bait consisting of 1 lb. of arsenate of calcium to 16 lb. of bran is recommended as a substitute. These two materials are thoroughly mixed together in a dry state, and then made into a crumbly mash by the addition of 2–2½ gallons of water. This bait is scattered in a thin layer along the rows of cultivated plants, or placed out in small pieces about the size of a walnut wherever snails are likely to congregate.

It is preferable to put out the bait in the late afternoon or early evening, so that it will remain fresh and attractive to the snails when they emerge for feeding. This bait is slower in acting than baits containing meta, usually taking three or four days to kill snails or slugs in noticeable numbers.

In the Orchard

By G. W. GAYFORD, B.Agr.Sc., Assistant Horticultural Research Officer.

Pollination of Apple Trees

THE subject, pollination of apple trees, usually occupies the minds of fruit growers at blossoming time, but afterwards very little thought is given to this very important process. This season, however, an object lesson has been provided by the partial failure of the apple crop. It is quite obvious that where varieties such as Jonathan and Ballarat (Stewart's Seedling) are grown adjacent to each other, a very much heavier crop has been obtained than where several rows of one variety are grown.

Consider firstly the mechanism of pollination. In order that the ovules in the flower should be fertilized by the nucleus from the pollen grain, the grains must be deposited on the stigma, usually by bees or other insects, where they will germiniate. The stigma is coated with a sticky material which enables the pollen grain to germinate and put out a germ tube. This penetrates the style, and down the tube pass the nuclei necessary for fertilization. The young fruits will not develop and remain on the tree unless this process is completed.

Under normal conditions of weather, the pollination mechanism works very well and a large percentage of flowers set fruit. The difficulty of upsetting this process has been shown by applications of blossom killing sprays of strengths which apparently damage the flowers and yet fail to interrupt pollination. However, unusually dry weather with hot winds may dry out the receptive stigmas or an infestation of thrips may so reduce the pollen supply by damaging the anthers that the flowers will fail to set. This was the case in many orchards this season where apples blossomed satisfactorily but failed to set crops, except where pollenizers were growing close together and consequently the concentration of pollen would be greater. Because of the thrips attack, pollen supplies have been low and some observant fruit growers noticed that bees were carrying very little pollen at all this year.

It should be pointed out that poor pollination and thrips infestation do not explain fully the reason for a poor crop because in some districts the amount of blossom was light. A similar season occurred in 1931-32, when the apple crop failure was partly due to thrips, but also appeared to be a result of the heavy rains which fell during the preceding summer of 1930-31, when lateral growth in December prevented fruit bud development. At that time the need for cross pollination was also evident because crops were satisfactory only where this had been provided. The point to be stressed, therefore, is that cross pollination is always necessary and during seasons where adverse conditions prevail, the growing of suitable varieties close together will be an insurance against crop failure.

Undoubtedly, the best method is to grow double rows of varieties blossoming at the same time, or if more of one variety is required than the other, planting the pollenizer the third tree in every third row is regarded as satisfactory. It may be necessary to rework the tree occupying this situation if a whole

block has been planted with the one variety. The other alternative is to place a bud or graft of the pollenizer in each tree. This method is practised with some success, although it is desirable to choose an apple that will mature at the same time as the main crop, otherwise there is a tendency to neglect fruit on the grafted branch when fruit on the rest of the tree has been harvested and these will act as a breeding ground for late codling moth activity.

Although no detailed information concerning suitable varieties for pollination is available, it is known from practical experience that most commercial apple varieties blossoming at the same time may be planted together for this purpose. Suitable pollenizers for the Jonathan are Ballarat (Stewart's), Statesman, or Rokewood. Granny Smith may be planted with Delicious, Jonathan, or King Cole.

The later blooming varieties, London Pippin and Rome Beauty are satisfactory cross pollenizers. The Gravenstein is a triploid and produces only a very low percentage of effective pollen. It should not be used as a pollenizer for other varieties but should be planted in a block containing at least two other varieties such as Jonathan and Granny Smith.

In the Flower Garden

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

THROUGHOUT spring and early summer, good rainfalls kept the soil well supplied with water, and there was little necessity to use the hose and sprinklers. Not only did this rainfall create excellent conditions for plant growth, but, together with the cooler weather, it checked the thrips epidemic which was becoming serious in late October and early November.

In soils well supplied with organic matter, the cool, moist weather aided the natural production of soil nitrates at a time when the home gardener must reserve the artificial forms of this fertilizer for the vegetable garden. It is now not permissible, even if they can be procured, to use any forms of artificial nitrogenous fertilizers, such as sulphate of ammonia, nitrate of soda, blood and bone, and market garden manure, on flower borders. These fertilizers, as well as stable manure, poultry manure, castor meal, &c., should be utilized in vegetable production. Withholding nitrogenous manures from the luxuriant foliaged plants, such as dahlias, will restrict their growth somewhat in all but the very fertile soils, but a fair amount of bloom will be obtained.

Lilium regale. This attractive lily blooms during December.

Lilies

The true lilies are becoming more popular in gardens, and, as their cultural requirements are understood, they will be more widely planted. Generally, they like a moist, cool, well-drained soil, either of a neutral or acid character, although some varieties, such as that early-flowering, white, fragrant variety—*Lilium candidum*, often called the "Madonna Lily," will tolerate lime. This lily flowers in November just before the long white trumpets of the "Christmas Lily" (*L. longiflorum*) commence to appear in early December. *Lilium dauricum* is another early-flowering variety, but has brilliant reddish-orange flowers which are borne in large upright clusters on the end of a stem about 2 feet high. This variety likes an open sunny

position in the garden, but others prefer partial shade, and most of them require shade on the soil near their stems. This shade can be provided by low growing plants, like Portulaca, Forget-me-not, Phlox Drummondi, or Azalea, depending on the situation. A heavy mulch of leaf mould or well-decayed manure is also beneficial.

Lily bulbs should be lifted only when necessary, and then they should not be allowed to dry out while out of the ground. Replant as soon as possible, preserving the rather thick roots at the base of the bulb.

Some lilies, e.g., the Madonna Lily, are only base-rooting, which means that all the roots which feed the bulb and the top of the plant are situated at the base of the bulb. Most of the other varieties of lily are base and stem rooting. The part of the stem between the top of the bulb and the surface of the soil forms a mass of feeding roots in these types, and hence they are usually planted much deeper than the lilies which are base-rooting only. Base-rooting lilies, like the Madonna Lily mentioned above, should be planted not deeper than 3 inches, and, in heavy soils, 1 to 2 inches of soil over the bulb is sufficient. On the other hand, the bulbs of the base and stem-rooting kinds, like the Christmas Lily, the Tiger Lily, *L. dauricum, L. Henryi, L. regale,* and *L. sulphureum,* should be planted from 5 to 8 inches deep in order to allow for the feeding surface above the bulb. The planting season is autumn and winter.

Dahlias

During January, dahlia plants grow quickly and the long shoots require to be tied securely to the stakes. This tying must be done in such a way that the plant does not twist around the stake in windy weather. Strong winds will sometimes twist the stems from the tubers if the tops are not tied securely enough.

Remove weak, spindly shoots, and if large-sized blooms are desired on the Giant Decorative types, disbudding will be necessary.

Maintain a careful watch for red spider which causes a light mottling of the leaves. To control this pest, spray with nicotine sulphate, 1 tablespoonful to 2 gallons of water. Add a small quantity of white oil emulsion or soft soap to increase the wetting properties of this spray. When spraying, direct the spray particularly to the underside of the leaves.

The active green larvae of the Light Brown Apple Moth, which web the young growing tips together and eat the developing leaves and buds, must be destroyed either by squeezing the webbed tips of the leaves between the fingers and thumb, or by spraying with arsenate of lead, 1 oz. paste or ½ oz. powder in a gallon of water.

Clematis

The Clematis is a very attractive climber of the lighter type, and is useful for covering arches, pergolas, stumps, fences, and walls, if suitable supports are provided. As it is usually sold in pots, it may be planted at any time of the year, care being taken not to disturb the roots if planting is done during the growing season. For the best results with Clematis plenty of humus and lime should be dug into the soil prior to planting. Plant in such a position that the base of the plant and the soil around it are in the shade, but the top of the plant, when it grows, should have abundant light.

C. Armandii, which has rich, shining, green foliage and produces fragrant, creamy-white flowers in early spring, is a very choice variety.

C. montana rubens has small leaves and deep, rosy-pink flowers.

C. Jackmanii and other hybrids, which are often called the large-flowered Jackmanii hybrids, produce very spectacular flowers measuring 5 inches or more in diameter.

C. Nellie Moser is another variety of the large-flowered type with light mauve petals having a reddish-carmine bar down the centre of each.

IN THE VEGETABLE GARDEN

Carrots and Parsnips

Carrots and parsnips should be thinned as soon as the seedlings are well grown. A good practice in the home garden is to first thin these crops to a distance of 1 to 1½ inches apart. Later, when it is noticed that the plants are about a third to half-grown, another thinning can be made, and the thinnings by this time can be cooked in the usual way or the young carrots may be used, shredded, raw, in salads. The ultimate thinning should be about 3 inches for carrots and about 4 inches for parsnips. When cultivating these crops, keep the soil drawn up to the plant to prevent greening of the carrot root and to maintain a good colour in the top of the parsnip root. If aphis appears on these crops, dust with a

nicotine dust or spray with nicotine sulphate and a little soft soap.

Dusting is often a much more convenient way of controlling some pests than spraying. A small portable duster, or a small converted hand bellows, can be obtained for this operation, and can be used for nicotine dust to control aphis, arsenate of lead dusts for cabbage white butterfly and cabbage moth control, and also for dusting with sulphur to control mildews and red spider.

Pumpkins, Marrows, &c.

The cucurbits—pumpkins, melons, marrows, squashes, and cucumbers—if planted in "hills" (which are really "craters") should be mulched with stable manure, compost, or even dried weeds or prunings from shrubs in the garden. If a layer of this material is placed in the crater-like depression in which the plants are growing, moisture can be conserved more easily. On the question of whether the main growths of these plants should be "stopped" or "topped" to induce fruitfulness, much can be written, but it appears that this practice is only worthwhile when the plants are exhibiting excessive vigor. The "stopping" of the main growths, temporarily checks growth and induces the formation of laterals. If growth is not excessive and the male and female flowers are plentiful, there appears to be no need to adopt the practice. In the early part of the season, some of these plants produce only male blooms, and therefore no fruits can set. Later, the female flowers appear and normal setting takes place. If "stopping" has been done just previously, the gardener may be easily led to a wrong conclusion and attribute the setting of fruit to "stopping."

Tomatoes

The "globe" and "cluster" varieties which are unstaked will require constant pruning. Remove all lateral growths, which appear in the axils of the leaves, while they are quite small. Some of these varieties were mentioned in these notes in the December number of the *Journal*.

The main leader growths should be tied securely to the stakes. Some of the cluster varieties, like *Guernsey Beauty* and *Recruit*, set their fruit in large clusters and the fruit tends to be rather small. To overcome this, the end of the cluster should be pinched off after six or eight fruits have set.

Plants which become affected by spotted wilt should be removed and burnt. Care should be taken not to handle healthy plants after handling these diseased plants, as the virus disease may be spread in this way. Thrips are also known to spread this disease.

Examine "crinkle" types of tomato plants, which are usually grown in the bush form, for signs of the grub of the tomato moth. This pest is usually more troublesome on the unstaked plants than on the staked. Dusting, with a 50 per cent. lead arsenate dust, or spraying with lead arsenate 1 oz. paste or ½ oz. powder per gallon plus a small quantity of calcium arsenate spreader, every ten days, will be found an effective means of control. Collect all infected fruit and burn it, and wash all other fruit before use.

A very useful Bulletin, "Tomato Culture in Victoria," is available on application to the Director of Agriculture, Department of Agriculture, Melbourne, C.2. The price is 5½d., which includes postage. This bulletin contains a very comprehensive list of tomato varieties and recommendations concerning their cultural treatment.

Seed Sowing

Seed of *Eastham* and *Savoy* varieties of cabbage may be sown this month. The usual precautions, mentioned in earlier notes, should be taken to prevent the seed-bed becoming dry during the hot weather.

Phenomenal Maincrop cauliflower seed can also be sown. Plants from these sowings will be ready for transplanting in March and April.

It is not too late to make another sowing of silver beet if more of this vegetable is required. *Fordhook Giant* and *Lucullus* are popular varieties. The seed may be sown thinly in drills and the young plants thinned from 10 to 12 inches apart. The thinnings may be used for transplanting or for cooking.

Another sowing of French beans can be made in January. Sowings of this vegetable made later than the end of January are usually of little value, unless the weather continues warm until the late autumn.

Red-cored Chantenay, Danver's Half Long, and *Shorthorn* varieties of carrot seed may be sown in drills about 1½ inch deep, covering the seed with ¾ inch of soil. Space the drills 15 to 18 inches apart.

Red beet seed also can be sown in drills in a similar way to carrots. *Detroit Dark Red, Crimson Globe,* and *Early Wonder* are suitable varieties.

Fruit and Vegetable Bottling and Pulping

By RACHEL M. PEILE, Fruit Preserving Expert

Fruit Bottling.

IN bottling fruit it is unnecessary to buy expensive equipment. A satisfactory steriliser can be made from a kerosene tin, a copper, or a boiler. Any air-tight jar can be used, while any type of stove is suitable.

It is advisable to bottle the fruit as soon as possible after picking.

First, a syrup is prepared by boiling together for 5 minutes water and sugar, 4 oz. to the pint. If preferred, fruits can be bottled in unsweetened water. Make sure that the jar, lid, and rubber ring are ready and in good order. Prepare the fruit by washing and peeling, halving or quartering as desired. Peeled fruit is put into slightly salted water to prevent discolouring. Pack fruit firmly into the jars, add two tablespoonsful of cold syrup, or, if the fruit will discolour, as pears and peaches do, cover with cold syrup. Place lid lightly on and place rings in steriliser, or else sterilize separately by boiling for 10 minutes. Soft berry fruits require no syrup in bottom of jar.

The jars are then placed on a stand in the steriliser and water is poured in until it is just below the level of the stand. A lid or cover is placed on the steriliser and the water brought to the boil and boiled until the fruit is cooked The time taken for berries is 10 minutes, for plums 15 minutes, cherries and apricots 20 minutes, peaches and pears 25 to 30 minutes, quinces 30 minutes to 1 hour. The fruit may be tested with a knitting needle. When ready the jars may be lifted on to a damp cloth, overflowed with boiling syrup, and sealed immediately. When cool the seals are tested, and the jars stored in a cool dark place.

Vegetable Bottling.

Most vegetables are lacking in acid, and are thus readily attacked by bacteria, consequently they require a treatment different from that used for fruits. They should be preserved by pressure cooking or by intermittent sterilization. Before using, it is a wise plan to boil bottled vegetables.

Prepare vegetables as for cooking by scrubbing or peeling and cutting as required, then blanch by dipping in boiling water. The time taken for beans and peas is 5 minutes, for root vegetables 15 minutes, while leafy vegetables may be steamed for 10 minutes. After blanching, dip immediately into cold water. Drain, and pack into jars. Fill the jars with brine (1 quart water and 1 oz. salt, boiled together, then cooled). Place ring and lid lightly on jar. For vacuum jars, overflow with brine, and seal.

Place jars on a stand in a steriliser (see "Fruit Bottling") and pour in cold water to reach about three parts of the way up the sides of the jars. Bring the water gently to the boil and boil for 1 hour. Overflow jars with boiling brine, put on rubber rings, and seal. Vacuum jars are simply lifted out.

The jars are allowed to stand for 24 hours, then the seals of the jars are loosened and the jars placed in the steriliser, brought to the boil as before, and sterilized again for 1 hour. After processing, the jars are again overflowed with boiling brine and sealed. They are allowed to stand for another day, then processed again for another hour, overflowed, and sealed. After this the jars are cooled, the seals tested, and the jars stored.

Faulty rings, carelessness in sealing, understerilizing, and cracked jars will cause vegetables to spoil. Never use vegetables with a bad colour or odour, or ones that are cloudy or bubbly in appearance. Burn or bury the contents of the bottle.

Tomatoes may be treated in the same way as fruits, processing for about 20 minutes. Beetroot is cooked until almost tender, cold dipped, skin removed, packed in slices in jars. The covering liquid is 1½ pints water, ¼ pint vinegar, 2 oz. sugar, 1 oz. salt.

Pulping.

Pulping is an economical method of preserving used for apples, tomatoes, peaches, and apricots.

Prepare the fruit as for cooking, put in a saucepan with just sufficient water to prevent burning, and cook until tender. Have ready such containers as preserving jars or treacle tins. These should be sterilized by placing in an oven or by heating over boiling water, as should also the cup or ladle to be used for filling. The boiling pulp is bottled immediately into the hot jars, which are stood on damp cloth and sealed. If preferred, sugar may be added or other flavouring such as salt, ginger, or cinnamon.

Codling Moth in Williams' Pears

Investigation in the Goulburn Valley District—1936-41

By L. W. MILLER, B.Agr.Sc., Assistant Entomologist, Biological Branch

THE codling moth (*Cydia pomonella* L.) is the most serious pest of pears in the Goulburn Valley irrigation area. In the Shepparton, Kyabram, and Ardmona districts there are approximately 3,500 acres of Williams' Bon Chretien pears grown principally for canning purposes. For some years past, the losses of pears due to the codling moth have been considerable. In 1936 it was estimated by executives of the Northern Victoria Fruit-growers' Association that codling moth losses accounted for as much as 20 per cent. of the crop, which represented a loss of at least £20,000 per annum.

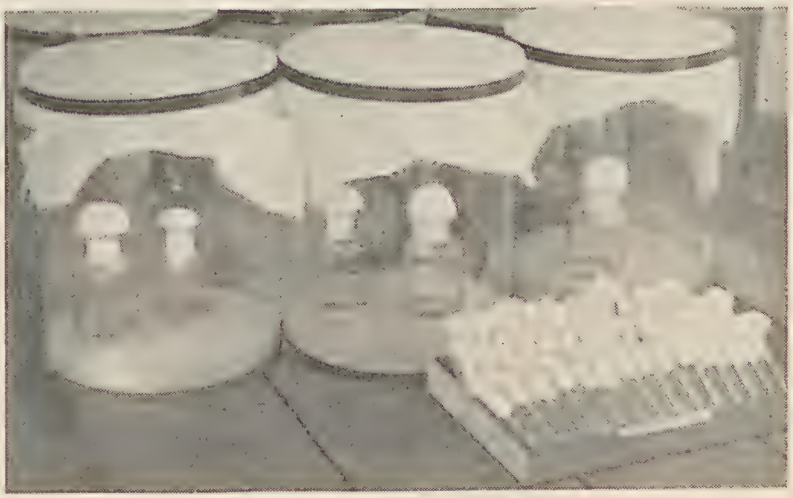


Fig. 1.—Oviposition jars.

Ward (1936) conducted a survey of the pear-growing districts in the Goulburn Valley, and found that there was a complete lack of uniformity among growers as to the control measures being used against the codling moth. Having no precise information on the seasonal activity of the pest, growers were not in a position to apply their sprays at the correct time, nor was there an efficient spray schedule in general use.

In response to a request from the Northern Victoria Fruit-growers' Association, and with funds made available from a Commonwealth grant for research and advisory work in relation to the apple and pear industry, an investigation of the problem of codling moth in W.B.C. pears was commenced in 1936.

For the first two years of the investigation, portion of the oriental peach moth laboratory at the Ardmona cannery was made available by the Council for Scientific and Industrial Research, and facilitated a study of the bionomics of the codling moth under Goulburn Valley conditions.

Life History Studies

Laboratory life history studies were conducted during the 1936-37 and 1937-38 fruit seasons. While it was not possible to completely duplicate in the laboratory, the life history of the codling moth as it occurs in the field, in all details, much valuable data was obtained from these studies which could then be correlated with orchard observations of the life history.

Laboratory Methods.

Large numbers of over-wintering larvae were collected from pear orchards in the district, brought to the laboratory, and allowed to spin up in strips of corrugated cardboard. In the spring, the moths on emerging, were sexed and placed either in lined cardboard cylinders, or in glass jars, so that oviposition records could be obtained.

The cardboard cylinders used in 1936 were similar to those used by Rosenberg at Farnham House Laboratory and described by Thompson (1930). They consisted of cardboard cylinders 10 x 8 inches, which were lined

Fig. 2.—Larval feeding jars.

internally with white paper, the ends being covered with sheets of cellophane. A 10 per cent. sugar solution was used as a food supply for the moths. Oviposition occurred on the lining paper and the cellophane ends. Each day the moths were removed to a fresh cylinder and the number of eggs counted. These cardboard cylinders were later discarded, however, in favour of 10 x 8 in. glass jars, which were internally lined with cellophane and contained about 2 inches of moist sand, plus a small feeding jar. The tops of the oviposition jars were covered with a piece of white gauze (see Fig. 1 on previous page). In order to obviate the danger of the moths being damaged by being transferred to fresh jars each day, the eggs were marked with a distinctive colour, using a different colour for each day. When the lining was removed, the eggs were cut off on small strips of the cellophane and placed in trays where they were allowed to develop normally. When the eggs reached the "black spot" stage, they were transferred individually to muslin covered jars each containing either an apple or a pear, allowed to hatch, and the resulting larvae allowed to feed on the fruit (Fig. 2). It was found impossible to have more than one larvae per fruit, owing to the cannibalistic habits of codling larvae.

When the mature larvae left the fruit, they were transferred to glass vials 3 in. x $\frac{5}{8}$ in., plugged with cotton wool, and allowed to spin up against the walls of the vials, thus allowing the transformation from larvae to pupae to be observed (Fig. 3). Later when the moths emerged in the vials, they were sexed and transferred to oviposition jars, and life history studies were carried on as previously described.

By these methods, individual records could be kept of each egg, larva, pupa, and adult. The data obtained from these life history studies over the two years 1936–38 have been summarized in the following tables (Tables 1–5). A short discussion on each stage of the life cycle of the insect has been included to clarify certain facts brought out in the life history tables.

The Egg.

The egg is flattened, oval in shape, and about the size of a pin-head, the shorter diameter being about 1 mm., and the longer about 1·25 mm. In the orchard the eggs are usually deposited singly on the foliage or fruit. The adults show a preference for depositing eggs on smooth rather than rough surfaces. About 24-48 hours prior to hatching, the dark head of the newly-formed larva can be seen inside the eggshell. This is termed the "black spot" stage of the egg.

Fig. 3.—Pupation tubes.

TABLE 1.—SUMMARY OF DATA RELATIVE TO THE LIFE HISTORY OF THE CODLING MOTH. MOOROOPNA, VICTORIA, 1936-1938.

—	Days—					
	Maximum—		Minimum—		Average—	
	1936–37.	1937–38.	1936–37.	1937–38.	1936–37.	1937–38.
Spring brood—						
Prepupal period	..	300	..	188	..	261·15
Pupal period	..	53	..	9	..	21·30
Total Cocoon period	..	320	..	210	..	279·60
Egg adult period	..	358	..	236	..	285·11
Preoviposition period	12	12	2	2	4·85	3·55
Oviposition period	20	15	1	1	11·45	7·03
First brood—						
Incubation period of eggs	13	15	5	4	10·22	9·49
Feeding period of larvae	51	56	19	17	27·35	26·73
Prepupal period	15	31	2	1	6·79	8·72
Pupal period	24	28	9	8	14·63	14·03
Total cocoon period	30	53	13	12	21·50	23·38
Egg adult period	85	92	48	42	57·61	61·50
Preoviposition period	13	4	2	1	4·31	2·18
Oviposition period	13	8	1	1	5·00	4·00
Second brood—						
Incubation period of eggs	11	9	3	4	6·46	6·87
Feeding period	35	32	14	11	22·21	21·13
Prepupal period	11	18	2	2	5·38	7·16
Pupal period	16	17	9	10	11·14	13·88
Total cocoon period	20	32	12	15	16·70	20·75
Egg adult period	55	59	38	37	47·00	47·87
Preoviposition period	No eggs	9	No eggs	1	No eggs	2·25
Oviposition period		12		1	1936	6·63
Third brood—						
Incubation period of eggs	..	10	..	4	..	6·59
Feeding period of larvae	..	40	..	11	..	23·06
Prepupal period	..	18	..	7	..	13·33
Pupal period	..	10	..	6	..	8·39
Total cocoon period	..	27	..	21	..	23·50
Egg adult period	..	53	..	43	..	50·00
Preoviposition period	Moths did not oviposit.					
Oviposition period						

The incubation period of the egg is largely influenced by the temperature. From Table 1, the wide variations in this period can be seen. In the spring the incubation periods ranged from 4-15 days with an average of approximately ten days, whereas in the summer, the incubation periods varied from 3-11 days with an average of approximately 6 days.

THE LARVA.

Codling moth larvae vary in length from 1·5 to approximately 20 mm. The head and thoracic shield are dark brown. The larva possesses three pairs of well-developed thoracic legs, and five pairs of fleshy pro-legs, and, when mature, the body colour varies from a pinkish shade to white.

The newly-hatched larva immediately seeks food, and although small it is active and may crawl a considerable distance before entering the fruit. The larva may feed to some extent on leaf surfaces, and does not burrow into the tissue to any extent until it reaches the fruit. The fact that the larva rejects the particles of apple skin when commencing to burrow into the fruit, which was first reported by Card (1897) and Slingerland (1898), is of considerable importance in controlling codling moth with stomach poisons.

The distance that a newly-hatched larva may travel was reported by Steiner (1939) to be as much as 10 feet on unsprayed trees, and up to 5 feet on trees sprayed with lead arsenate.

The feeding period of the larvae ranged from 17-56 days with an average of approximately 27 days for the first brood, but later in the summer with more favourable conditions the range was 11-35 days with an average of approximately 21 days.

Table 2.—Summary of Data Relative to Percentage of Larvae Overwintering in Each Brood.

Brood.	1936–37.	1937–38.
	%	%
First brood	7·14	5.56
Second brood	87.72	22·22
Third brood	..	88·31

In each brood in the Goulburn Valley, a certain proportion of the larvae overwintered until the following season. In each succeeding generation, there were successively greater percentages of wintering larvae. In 1936-37 a high proportion of the second brood larvae overwintered, whereas in the following year 22 per cent. of this brood failed to transform.

The Cocoon.

The cocoon is a silken covering spun by a mature larva, within which it hibernates or transforms to the pupa. The mature larva on leaving the fruit either drops to the ground, or crawls down the tree, seeking a place suitable for spinning a cocoon. In the Goulburn Valley a high proportion of the larvae spin their cocoons on the tree either in cracks on the trunk or under loose bark, &c. Some of those larvae falling to the ground spin up in rubbish on the soil beneath the tree.

The cocoon period (prepupal and pupal periods) for transforming individuals ranged from 12-53 days for the first brood and from 12-32 days for the second brood. In the third brood in 1937-38, the average period was approximately 24 days. The cocoon period for overwintering individuals ranged from 210-320 days with an average of approximately 280 days.

The Pupa.

On the completion of the cocoon, the larva becomes quiescent until it commences to change in to the pupa. This prepupal period averages from 6-8 days during the summer, after which the yellowish pupa, approximately ½ inch long, is formed. The pupa gradually darkens, becoming almost black just prior to the emergence of the adult. The length of the pupal period was found to average from 13-15 days for transforming individuals and approximately 21 days for overwintered individuals.

In no case during the investigation did a pupa overwinter, which is confirmatory of the observations of Headlee (1936).

The Adult.

The adult codling moth is variable in size, with a wing expanse usually less than ¾ inch. The wings are brownish-grey and crossed with dark lines. Near the tip is a brownish coloured spot in which are two irregular lines of a coppery or golden colour. The hind wings are greyish brown above and darker towards the margin which is finely fringed.

The male is usually slightly smaller than the female and can be distinguished by either the anal characters or by the presence of a black spot beneath the fore wing. The proportions of the sexes present in the different broods in the laboratory usually approximated to 50 per cent. of each (Table 3).

Table 3.—Summary of Data Relative to the Proportions of the Sexes Present in the Different Broods.

—	Per cent. Males—		Per cent. Females—	
	1936–37.	1937–38.	1936–37.	1937–38.
Spring brood ..	48·33	49·32	51·67	50·68
First brood ..	48·37	50·10	51·63	49·90
Second brood ..	..	39·51	..	60·49

The length of life of the moths in glass jars in the laboratory varied from 2-32 days, with an average of approximately eleven days during the spring, but was considerably less in later broods (Table 4). These figures possibly may be considerably less than the life of the moths in the field, since moths tend to become damaged when confined in glass jars.

Egg deposition usually commenced 2-5 days after the females emerged, although preoviposition periods of up to thirteen days were recorded (Table 1). The duration of oviposition averaged from 4-11 days (Table 1), but may be much longer.

TABLE 4.—LENGTH OF LIFE OF THE MOTHS IN DAYS.

	Maximum—		Minimum—		Average—	
	1936–37.	1937–38.	1936–37.	1937–38.	1936–37.	1937–38.
Spring brood—						
Life of males	32	21	2	2	11·45	10·12
Life of females	32	21	3	2	13·18	10·71
First brood—						
Life of males	16	14	1	1	6·56	6·51
Life of females	16	14	2	1	8·55	6·09
Second brood—						
Life of males	..	13	..	2	..	7·87
Life of females	..	14	..	2	..	8·25

The figures given in Table 5 for the number of eggs laid per female are far lower than those quoted in most American literature, which may be due either to the laboratary equipment not being as satisfactory as that used overseas, or the strain of codling moth in the Goulburn Valley may be less fecund than the American moth.

TABLE 5.—NUMBER OF EGGS PER FEMALE FOR EACH BROOD.

	Number of Eggs per Female—			
	Maximum—		Average—	
	1936–37.	1937–38.	1936–37.	1937–38.
Spring brood ..	25	28	5·34	4·96
First brood ..	45·5	42	5·16	9·12
Second brood ..	No eggs in lab.	38	..	15·34
Third brood ..	..	No eggs in lab.	..	..

Eggs were usually deposited in the late afternoon, provided the temperature was above 62°F.—conditions for oviposition which were reported by Isely and Ackerman (1923) in their studies on codling moth in Arkansas.

The adults usually emerged during the day, providing the temperature was favourable.

THE LIFE CYCLE.

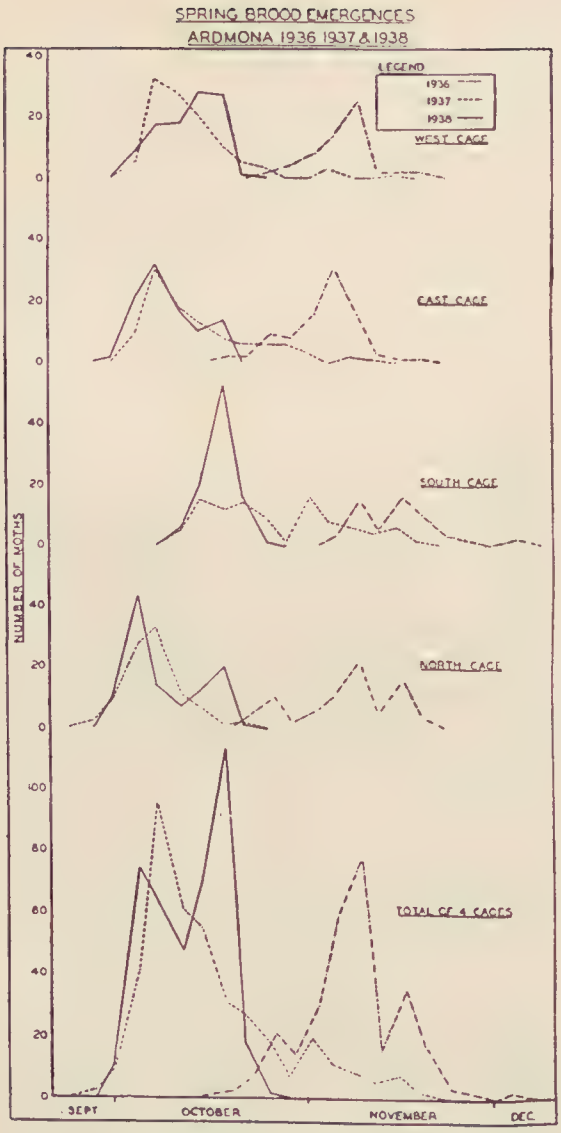
The life cycle (period from egg to adult, Table 1) for transforming individuals ranged from 42-92 days for the first brood, with seasonal averages of 58 and 62 days. In later broods the life cycle was completed in a shorter period, averaging approximately 48 days for the second brood and 50 days for the third brood. The life cycle of overwintering individuals varied from 236-358 days with an average of 285 days.

In 1936-37 there were two complete or partial generations in the laboratory. The second-brood moths emerging in the laboratory failed to oviposit, but in the orchard there was definite evidence of the presence of third-brood eggs and larvae. In 1937-38 there were three complete or partial generations. Here again, although no eggs were deposited by the third-brood moths in the laboratory, fourth-brood eggs and larvae were seen in the orchard on late varieties of pears and apples.

Spring Brood Emergence

Four emergence cages of the type described by Peterson and Haeussler (1928) were used in the orchard to determine the dates of spring-brood emergence. The cages, which were arranged on posts, 30 inches above the ground, so that one faced each cardinal point of the compass, each contained approximately 100 overwintering larvae. In the spring bi-weekly counts were made on the moths emerged, and from these figures Graph 1 (next page) was drawn.

The earliest emergence occurred in the North Cage in 1937 and 1938, and in the East cage in 1936, and the latest emergences occurred in the South Cage in all years. The variation in the time of the emergence of the spring-brood moths depending on the position of the overwintering cocoon was thoroughly investigated by Peterson and Haeussler (1928). This factor may account for the prolonged period over which spring-brood moths are present in the orchard in the Goulburn Valley, as shown by the lure records.



Graph 1.—Spring brood emergences, Ardmona, 1936, 1937, 1938.

Codling Moth Activity

Throughout the investigation, lure records were kept in the Goulburn Valley so as to have a guide to the seasonal activity of the codling moth. Four types of attractants were used during the course of the investigation, namely, vinegar, golden syrup, molasses, and wine. In each case a 10 per cent. solution of the attractant in water was used. During the 1937-38 season tests were conducted on the relative efficiencies of three attractant solutions—vinegar, golden syrup, and molasses, of which molasses proved the most effective.

From 1939 onwards, wine was used in place of molasses, following the recording of superior catches of moths in this solution in other areas of Victoria. The lure catches were used as bases for the timing of spray applications throughout the investigation.

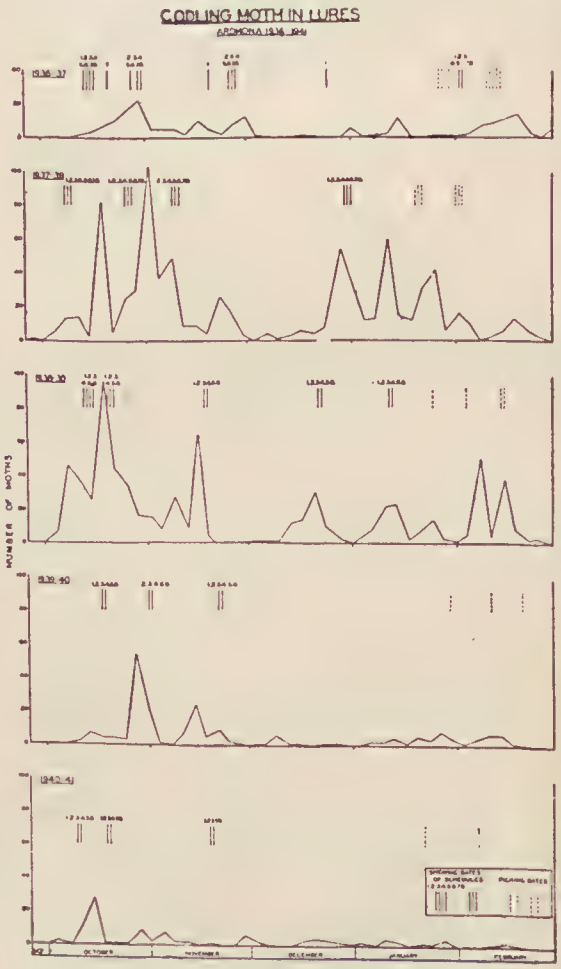
TABLE 6.—NUMBER OF MOTHS TRAPPED IN EACH LURE SOLUTION TESTED, 1937-38.

Lure Solution.	Number of Moths—		
	Male.	Female.	Total.
Vinegar ..	179	141	320
Golden Syrup ..	308	376	684
Molasses ..	373	424	797

The seasonal activity for each year of the investigation is shown in Graph 2.

SEASON 1936-37.

In this season, 32 lures containing a 10 per cent. vinegar solution were used. The first moths of the spring brood were trapped on 12th October, and the last of this brood were trapped on 3rd December. The duration of



Graph 2.—Lure records, Ardmona, 1936-41.

this brood was therefore 52 days. During this period a peak of activity occurred on the 29th October. Owing to a sudden lowering in the daily temperatures, a low catch was recorded on the 2nd November, but on an improvement in the weather, a further peak of activity was recorded on 5th November. These two peaks may be considered as one with the cold snap acting as a temporary check to moth activity. Two further minor peaks were recorded for this brood—on the 16th and 30th November.

In a progress report published at the completion of the first year of the investigation (Pescott and Miller, 1937) it was assumed that the moths trapped between December and March were all of the first brood. Later work, however, has shown that this was incorrect, and that the last of the first-brood moths was trapped on 18th January, after which second-brood moths were present until March.

Season 1937-38.

Spring-brood moths were present in the orchard some fifteen days earlier than in the previous season; the first moths of this brood being recorded on the 27th September, and the last on 29th November, a total period of 63 days. During this period, peaks of activity were recorded on both the 18th October and the 1st November. First-brood moths were trapped from the 6th December until the end of January, with three main peaks of activity, namely, the 28th December, 11th and 25th January. The second brood, which reached its peak of activity on the 17th February, overlapped the latter part of the preceding brood.

The catches of moths in this season were considerably greater than in the preceding season. For example, 630 moths were caught in 32 lures in 1937-38, as against 203 in these same lures in 1936-37.

Season 1938-39.

Owing to the fact that a new site was used for the experimental block in this year, the lure records were taken from a different block to those of the previous seasons. The duration of activity of the spring brood, from 4th October to 18th November, was 45 days, which was shorter than in either of the previous seasons. The main peak for this brood was on 18th October, with a slightly smaller one on 15th November. The first brood, which commenced on the 2nd December, continued until the end of January, when both first- and second-brood moths were present. During the first brood two peaks of activity were recorded—on 20th December and 13th January. Second-brood moths were particularly active in the orchard in this season, especially on the 7th and 14th February.

Season 1939-40.

The first moths of the spring brood were trapped on 10th October. The first peak of this brood occurred on the 27th October, with a further peak on 14th November. The last moths of this brood were trapped on 24th November. For the remainder of the season, consistently small numbers of moths were trapped in the lures.

Season 1940-41.

As in the previous season, the moth activity was mainly restricted to the spring-brood moths. During the period of activity of this brood, two peaks of activity were recorded—on the 14th October and 28th October.

In general, the lure catches for this season were extremely low, particularly in the later broods.

Discussion on Moth Activity

In each year of the investigation, there were three broods of moths present in the orchard —the spring, first, and second brood moths. Normally in the Goulburn Valley, Williams' pears are harvested at about the same time that second-brood moths commence to oviposit. Consequently, in any year when the harvesting is delayed, there is a definite danger of quite severe late infestations developing, which in some seasons may not become manifest until the fruit is ripening in the cannery.

The low catches of moths recorded during the latter part of both the 1939-40 and 1940-41 seasons may be accounted for by the fact that the lure records throughout the investigation were taken on the block where control experiments were being conducted. Since, in the latter two seasons of the investigation, the control experiments were mainly directed at achieving a maximum control of the first-brood larvae, the failure to trap many first-brood moths was fairly definite evidence of successful first-brood control.

The lure records for the spring brood usually showed two main peaks of activity, one in October and the other in the earlier half of November. In all probability, this was due to the influence of the site of hibernation on the time of emergence of the moths as has already been discussed. The first of the spring-brood peaks representing moths emerging from

cocoons that were facing towards the north and the second peak being due to the activity of moths from cocoons on the colder, southerly sides of the trees.

Codling Moth in Relation to the Weather

The timing of codling moth spray applications by means of lure pot catches has been practised for some years in the apple and pear growing districts of Victoria. While there is ample evidence that such a method is more satisfactory and economical than methods that do not take the activity of the moth into account, there are, however, certain serious shortcomings associated with the use of lures as a means of timing spray applications.

Most orchardists in the Goulburn Valley take from 7-10 days to complete the application of a single codling spray. Since, however, the incubation periods of the eggs may be as short as four days, there is a danger than an orchardist who commences the application of a cover spray immediately following the recording of a peak of activity may not be able to complete the spray before the eggs hatch. This is likely to happen with mid-season sprays, even when the lure records are kept by the most accurate method, i.e., by recording daily catches of moths. Where the lure catches are recorded less frequently, the danger is accentuated, and for the Goulburn Valley at least, the recording of lure catches on a weekly basis, as is sometimes done, is too inaccurate to be of any real value.

Thus, it was obvious that some method of prediction of brood emergences was necessary so that fruit growers could commence the application of cover sprays actually before peak egg laying occurred, and the application could then be completed prior to the hatching of the eggs.

With this object in view, an attempt was made to find some accurate method by which the emergence of broods could be predicted in the Goulburn Valley.

The influence of weather on the development of the various stages of the codling moth has received considerable attention by entomologists. Glenn (1925) adopted a method of summing the effective temperatures in degree days for predicting the time of emergence of the codling moth. Glenn's method has been criticized, since factors other than the temperature were not taken into account. Shelford (1927) conducted an investigation of the relations of the codling moth to weather and climate. From his work he introduced a new unit, the *developmental unit,* which, for any stage in the life cycle of the insect, was defined as the "difference in amount of development produced in one hour by a difference of one degree of mean medial variable temperature (other conditions being average) as shown by the difference in time required to complete the stage."

The developmental total for any stage is the sum of developmental units for that stage. Developmental totals are not constants, but vary with the rainfall of the season, with other weather factors, with the generation, and with the individual.

In attempting to predict the emergence of moths by Shelford's method, thermohygrograph records are kept in the orchard. From these records, the temperature and relative humidity in each hour of each day of the week can be determined. Each combination of temperature and humidity can then be converted into velocity values (i.e., the number of developmental units per hour). These developmental units per hour are then summed until the developmental total for the particular stage of the insect is reached.

During this investigation of codling moth, thermohygrograph records were kept for each of the five seasons. By means of these records, together with field and laboratory observations on the life history of the moth, it has been found that Shelford's data could be applied to the Goulburn Valley with a high degree of accuracy in predicting the emergence of broods.

It would appear, therefore, that by the establishment of suitable weather stations in the Goulburn Valley, a more accurate method of timing spray applications could be put into practice.

The concluding portion of this article dealing with the Control of Codling Moth, will appear in a subsequent issue of the Journal.

WORK! DON'T SHIRK!! LEND! DON'T SPEND!!

Cool Storage of Apples and Pears

Under "Acquisition," 1942

By G. B. TINDALE, B.Agr.Sc., Cool Storage Research Officer

Since the outbreak of war, the entire Victorian apple and pear crops have been acquired by the Australian Apple and Pear Marketing Board. In order that each season's fruit crop might be marketed throughout the year, it was necessary for the Board to undertake the cool storage of practically all the fruit acquired. In the 1942 season, the Board stored apples and pears in 91 cool stores scattered throughout Victoria, most of the stores being situated in fruit-growing districts close to Melbourne.

During the year, a survey of these stores was made by the writer with the object of advising the Board as to the condition of the fruit in storage, and its potential storage life, and to make suggestions as to where improvements might be effected in the future.

A report on the survey was prepared and presented to the Board on the assumption that acquisition would continue during 1943. Since then, however, the Board has ceased functioning so far as Victorian fruit is concerned, and each grower will now be obliged, as in the past, to make his own arrangements for the cool storage and marketing of his apples and pears.

The survey provided a unique opportunity for studying commercial practice as it prevails throughout the State, and of noting the extent to which recent advances in cool storage technique have been applied commercially. While the report contained certain "domestic" matter of interest to the Board only, yet it also contained much matter which might be regarded as general information, and it was felt that the latter should be passed on to those who, from now on, will be concerned with the cool storage of apples and pears. The following article, consisting of extracts from the above-mentioned report, is accordingly presented.

ALTHOUGH apples are stored in Victoria in the greater quantity, more losses were observed in pears, and there is greater scope for improvement in the storage of pears. The first part of the report will deal at some length, with the storage of pears, to be followed by a shorter section dealing with apples.

Prior to "acquisition," the pear-growing industry centred in the metropolitan area catered almost exclusively for overseas markets and, to a lesser extent, northern interstate markets. So far as export was concerned, all pears were shipped and consumed within, say, four months of harvesting, which is well within the storage life of most varieties, and of late years little difficulty usually was experienced in the successful export of pears. Now an effort is being made to absorb all these pears locally and to spread the seasons until, say, December, which involves a storage period of eight months. The storage life, however, of each variety at any particular storage temperature is definitely limited, and the survey showed that many pears were being overstored. Early in the survey, overstored Boses were seen, later on overstored Packhams were seen, and later still overstored Winter Coles, while during November wastage was high in the few pears still remaining in cool storage.

The difficulty with pear storage is that there is little to guide one by visual inspection in storage as to when the pear is approaching an overstored condition. On removal from storage, however, overstored pears rapidly develop disorders, usually before the retailer can dispose of them. The disorders referred to are skin scald and grey discoloration of the flesh, particularly around the core. In addition, the overstored pear develops a particularly unpleasant taste and odour. Some of the longer-keeping varieties are not so subject to scald development when overstored, but become readily attacked by moulds, usually penicillium, simply because as the life of the pear draws to a close it no longer can offer natural resistance to mould attack. The storage life of our main commercial varieties, under various storage conditions, has, however, been accurately determined, and with a knowledge of the variety and its storage and pre-storage conditions (such as maturity at picking time and interval between picking and cooling) the length of storage life of each variety can be fairly accurately stated.

As stated before, the conclusion was reached that certain varieties were being stored too long, and to check up on this conclusion an inspection of city fruit shops was then made. Invariably, it was noticed that such varieties were at that time either developing scald or going mouldy in the shop window. Apart from the loss to the retailer, his experience would warn him against the purchase of any further supplies of pears of that variety, even though excellent lines of non-overstored pears of the same variety might still be available. It should be stressed here that the retailer, by inspection, is not able to tell whether the pears recently moved from cool storage are overstored or not.

Before submitting suggestions for future improvement, it is necessary to discuss in some detail the factors which determine the storage life of pears. They are as follow:—(*a*) Variety, (*b*) time of picking, i.e., maturity, (*c*) period between picking and cool storage, (*d*) temperature of storage, (*e*) composition of storage atmosphere.

The main varieties grown are the W.B.C., Bosc, Packham, Josephine, W. Cole, W. Nelis. For each of these varieties there is an optimum picking period extending over two to three weeks for all varieties, except for the W.B.C., for which variety the optimum picking period is less, i.e., one to two weeks. If picked before the optimum picking dates, the pears are immature, and even though they store well they fail to ripen satisfactorily after storage. If picked after the optimum picking dates, the ripening processes will have proceeded somewhat, and the storage life will be reduced. When the pears are picked, especially in hot weather, the ripening processes are accelerated, and any undue delay between picking and storage will reduce storage life.

Thus, pears which are late picked or delayed in storage are suitable for short storage only. Provided such lines are marketed first, they need not represent any loss. Indeed, they would probably be of excellent quality, even though from the storage point of view they would have to be marked as "weak" fruit. Several such weak lines were observed during the survey and could be detected by advancing ground colour combined with softening flesh as recorded by the standard penetrometer, while odd lines had become "wasty" in storage and attacked by mould.

Mention has been made that each variety of pear has an optimum picking period, which for the main varieties is as follows:—

W.B.C.—Last week in January to first week in February.

Packham.—Last week in February, plus or minus one week.

Bosc.—First week in March, plus or minus one week.

Josephine.—Second week in March, plus or minus one week.

W. Cole.—Third week in March, plus or minus one week.

W. Nelis.—Last week in March, plus or minus one week.

Varieties received after these dates should be marked as weak lines, and are suitable for short storage only.

Assuming now that, apart from odd weak lines duly recorded, the pears were picked over the correct period and promptly stored, the storage life will then depend on (*a*) storage temperature, (*b*) composition of storage atmosphere.

Concerning storage temperature, the longest storage life will be obtained at the lowest temperature possible without freezing, i.e., at 29 degrees Fahrenheit. The numerous cool stores vary considerably in their design and efficiency and their ability to maintain uniformly low temperatures throughout their pear chambers. Some stores, by reason of their design, can maintain a low temperature uniformly throughout their various chambers, while other stores cannot.

In the latter stores there are relatively warm and cold positions within a chamber, and it is not possible to "keep" pears as long in such stores as in the former stores.

As the storage life or keeping quality of pears depends so much on storage temperature, and hence the type of store, it is desirable at this juncture to make a classification of cool stores according to their design. A classification into four classes may be made.

1. Stores which are able to maintain a uniform temperature throughout the chambers, by reason of overhead coils evenly spaced, and able also to maintain a constant temperature of 29 degrees by reason of automatic control of plant. There are only four such stores. By reason of their accuracy of temperature control, these are the best pear stores.

2. Stores which are able to maintain a uniform temperature throughout the chambers, by reason of overhead coils evenly spaced, but by reason of manual control of plant can maintain a fluctuating temperature only. Fluctuations must always be above 29 degrees, otherwise freezing would occur. The temperatures in such stores would fluctuate from, say, 29 to 32 degrees, so the average temperature would be

a degree or two higher than stores in class 1, with a consequent slight reduction in storage life. There are several stores in this class, all of which could be regarded as excellent pear stores.

3. Stores in which, by reason of their design, it is impossible to maintain a uniform temperature throughout the chamber, i.e., there are permanent relatively warm and relatively cold positions. In addition, owing to manual control, all temperatures fluctuate upwards. In operating such stores, the engineer cannot work below 29 degrees in the coldest position, otherwise freezing of the fruit would occur. At the same time, the temperature of the warm position may be, say, 3 degrees higher (or even more). Then during such times as the plant is not working, all temperatures would rise, say, 2 to 3 degrees, so that it is unlikely that an average temperature below 32 degrees could be maintained. Stores in this class would include (*a*) the air circulation stores, in which there is a cold position in the neighbourhood of the air inlet duct and a warm position in the neighbourhood of the air suction duct. Also, (*b*) direct expansion stores, where the coils are not evenly spaced but confined to two or three banks, in which case there is excessive cooling in localized areas.

4. Stores in which, by reason of their design, fairly large temperature variations exist throughout the chamber, and in which, by reason of manual control, all temperatures fluctuate upwards. Stores under this heading include the old style direct expansion stores with wall grids only. In such stores, the heat brought in to the chamber initially by the fruit and cases, and later by "leakage" through the walls and door when open, rises to the ceiling and persists there as a warm layer. In such stores the warm ceiling region can be 5 to 6 degrees warmer than the cold region at the floor level beneath the coils. In stores of this class the top fruit always "moves," and will even ripen months ahead of lower fruit. Such stores are not suited for long pear storage, but are quite suitable if only short pear storage is contemplated. Only a few of such stores now remain, several having been "modernized" with overhead coils during recent years.

Discussing now the above classification of stores into the four classes, we can regard class 3 as average stores, in which it is possible to maintain an average temperature of 32 degrees, but not lower. Stores in classes 1 and 2 would be better than average, while stores in class 4 would be below average. (It should be stressed, however, that this classification could be considerably modified by the "personal factor" in the matter of the engineer in charge, i.e., a less efficient engineer would not be greatly concerned if his temperatures frequently fluctuated over a wider range of temperatures, and thereby reduced storage life of the fruit.)

In "average" stores (class 3) the storage life of the main pear varieties could be stated as follows:—

W.B.C.—2½ months.
Bosc—3½ months.
Packham—5 months.
Josephine—5 months.
W. Cole—5 months.
W. Nelis—6 months.

This would mean that the storage life of these varieties stored in stores of class 3 would be over by—

W.B.C.—mid-April.
Bosc—mid-June.
Packham—end July.
Josephine—mid-August.
W. Cole—end August.
W. Nelis—end September.

It is suggested that pears stored in these stores (class 3) should not be stored beyond these dates, otherwise they will develop disorders on removal from storage.

Owing to the lower temperature which it is possible to maintain in stores in classes 1 and 2, the storage life of each pear variety is increased by approximately a month (even slightly more in the stores of class 1). Hence, pears stored in stores of classes 1 and 2 could be stored until the following times without being overstored:—

W.B.C.—until beginning of May.
Bosc—until middle of July.
Packham—until end of August.
Josephine—until mid-September.
W. Cole—until end September.
W. Nelis—until end October.

Pears stored in stores of class 4 would mostly have a storage life about one month less than when stored in "average" stores of class 3, and should be removed correspondingly early.

Composition of Storage Atmosphere

In addition to storage temperature, the storage life of pears is influenced by the composition of the storage atmosphere. Where pears and dessert apple varieties are stored together, the pears are subjected to a dose of ethylene as the apples pass through their

ripening phase. The ethylene has the property of hastening the life processes in unripe fruit, and is used commercially for ripening bananas and oranges. Hence, where pears and ripe apples are stored together, the storage life of the pears will be considerably reduced. Many such forward lines of pears were seen when stored adjacent to ripe apples. If pears and apples must be stored together, then, so far as possible, green varieties like Granny Smith or Stewart should be chosen, for they will not have reached the ripe phase of their life, at which stage the ethylene gas is given off. Generally speaking, where apples and pears are stored together, a reduction in storage life of the pears of at least a month should be allowed for.

Another gas in the storage atmosphere which has a profound effect on the storage life of pears is the carbon-dioxide continually respired by the fruit itself. In well-built direct expansion stores, filled with pears early in the season and then kept closed for long periods, the carbon-dioxide respired undoubtedly accumulates. Indeed, in some stores the gas was so "high" that breathing became most difficult. Later, measurements were made of CO_2 gas content of various stores, and even then when the chambers were being "worked on" some chambers showed 3 per cent. and 4 per cent. of CO_2, so for certain periods at least there is an "accidental" accumulation of gas at a level considerably higher than 4 per cent. The presence of gas in the pear chambers is invariably considered to be bad practice, for it is always accepted that all living things require plenty of fresh air. Some direct expansion stores have actually installed fans so that they can give them "a good blow out," and hence introduce fresh outside air. Contrary, however, to the generally accepted belief that gas in the chamber is bad practice, and must be got rid of, it has been well proved that a certain amount of CO_2 gas up to, say, 8 per cent. is highly beneficial in that it further slows down the life processes, and hence increases storage life. Indeed, it is the deliberate control of this gas which is the basis of the relatively new system of "gas storage." In England, gas storage is now used extensively, and in Australia the first gas store for pears is in operation at Shepparton.

Normally, much trouble is required to make a cool store gas-tight, but several metropolitan stores are at least fairly gas-tight, even with their present construction. In such stores it should be possible to hold the CO_2 gas at, say, 5 to 8 per cent. Gas-storage experiments with Doncaster pears have shown that when stored at 32 degrees in 5 to 8 per cent. CO_2 the storage life of the main varieties is considerably increased compared with air storage at the same temperature. When so stored, the storage life of the main varieties was as follows:—

W.B.C.—5 months.
Bosc—6 months.
Josephine—5½ months.
Packham—7 months.
W. Cole—8 months.
W. Nelis—8 months.

When stored at 29 degrees, a further increase of one month is possible. Hence, in stores of classes 1 and 2, if gas storage were adopted, it should be possible to hold the various varieties until the following dates:—

W.B.C.—end July.
Bosc—end September.
Josephine—end September.
Packham—end October.
W. Cole—end November.
W. Nelis—end December.

The fact that certain stores of classes 1 and 2 in which CO_2 gas were present usually hold their pears in quite good order until late in the year, strongly indicates that their good results have been brought about by some accidental gas storage, in addition to their excellent control of temperature.

From consideration of the above, the conclusion is reached that without gas storage, even in the best stores, the storage life of all varieties except Nelis is over by the end of September, and that of the Nelis by the end of October. However, by means of gas storage at 29 degrees the Packham could be stored until the end of October, the Cole until the end of November, and the Nelis until the end of December, or in other words, it is only by gas storage that the market could be supplied with pears of excellent quality during the last three months of the year.

Finally, there is the matter of ripening pears after storage. It is not of much use successfully storing pears if they are presented to the public in a green condition and as hard as a piece of wood. In the past, quite an extensive trade has developed in Brisbane and northern markets with Victorian pears, while Melbourne itself has been a remarkably poor market. This may be explained by the fact that in northern markets prevailing temperatures are sufficiently high for pears to ripen normally, whereas in Melbourne, from April onwards, temperatures are too low for ripening to proceed.

This great weakness in the marketing of pears locally was recognized this year, and the Board undertook the operation of two ripening chambers. Inquiries to the Board's salesmen at the Victoria Market revealed that an excellent job was being performed. Knowing the really wonderful quality of the pears ripened at the optimum ripening temperature, the salesmen can personally recommend them and have no difficulty in effecting sales. On the other hand, it is most difficult to push the sale of hard unripe pears which will not ripen.

There seems but little doubt that greatly increased pear sales could be made on the local market by the adoption of controlled ripening of all pears after storage starting from April onwards. The Bosc ripens best at 65 degrees, and later-maturing varieties—Packham, Josephine, and Cole—at 60 degrees. About a week is required for most varieties, and longer for the Nelis. During the May-September period, there is very little risk indeed of the pears becoming ovverripe when they leave the ripening chambers, because atmospheric temperatures are then too low to permit further ripening to proceed.

It is strongly urged that much greater attention be given in the future to the controlled ripening of pears ex cool store.

Apples

The apples stored in Victorian cool stores during 1942 could be classified into three categories:—

(*a*) Locally grown apples.

(*b*) Apples grown in other districts.

(*c*) Tasmanian grown apples.

Wastage in the locally grown apples was usually slight, and about the same as that prevailing in normal times. Wastage in apples grown in other districts was frequently considerable, while wastage in the Tasmanian applies was often extremely high.

Mention must be made, however, of the fact that there was tremendous variation in both the (*b*) and (*c*) classes, there being both good and bad lines. As the storage conditions were similar for lines good or bad, it is obvious that the poor storage results with many lines were due to certain pre-storage conditions, of which the most important are maturity (time of picking), the period which elapsed between picking and storage, and the temperature conditions which prevailed during that period.

Each apple variety has an optimum picking period which does not exceed three weeks, but varies, of course, with variety, according to whether the variety is early, mid-season, or late. Apples picked after their optimum picking period become soft and have a considerably reduced storage life.

Apples received into metropolitan stores from "outside" districts were mostly all late picked fruit (and hence "weak" fruit), because of the fact that the early picked fruit is naturally used to fill the local store, and it is only when the local store is filled that storage is sought for the surplus fruit (the late picked fruit) in other districts. The storage life of these late picked apples is frequently further greatly reduced by the delay which elapses before transport can be obtained to forward the fruit to metropolitan stores. In cool weather, each week's delay between picking and storage would reduce storage life by a month, while in hot weather the reduction in storage life would be much greater. The suggestion is made that when each line of apples is received for storage, the following particulars (in addition to variety and size) be recorded:—(*a*) date of picking, (*b*) date of storage, (*c*) temperature conditions prevailing between (*a*) and (*b*). With a knowledge of these particulars, a fairly accurate estimate of storage life may be made, whereas without such information storage is more or less a gamble.

The above is a general review of the apple position as observed in the various cool stores. As the varieties vary so greatly in their susceptibility to storage disorders, and in their storage requirements, it will now be necessary to refer to the main varieties individually.

Apples are commonly divided into two classes—(*a*) those picked when the ground colour is green, called the "cookers," i.e., Granny Smith, Stewart, London Pippin, Cleopatra, and (*b*) the dessert apples, which are picked at a much more advanced stage of maturity when the ground colour is green-yellow and the exposed side blushed red. The main varieties in this class are the Jonathan, Delicious, Rome, Statesman, Yates, Democrat.

There is a tendency among growers to pick the apples in the (*b*) group much too late, in the desire to obtain the maximum amount of red "blush." All late-picked or late-stored apples are suitable for short storage only.

There is also a tendency to regard size in apples as a criterion of their keeping quality. This scarcely applies, however, to apples in

class (*a*) (nor with pears), and applies to varieties in class (*b*) only when relatively advanced in maturity, but generally the larger the apple the more mature it is, so that it is good practice to grade the apples for size and market the largest sizes first. It is most undesirable, however, to unduly delay the storage of apples while awaiting grading, but where grading for size can be carried out with reasonable expedition prior to storage it is a practice which should be adopted where possible.

The "green" varieties generally store very well, mainly because they are picked in an immature condition. The Granny Smith and Stewart form the bulk of this class. Some few years ago, it was a fairly general practice to delay the storage of these varieties after picking for a period of two to three weeks, in an effort to prevent the development of Superficial Scald in storage. Tests, however, proved that the chances of effecting control by that method were quite remote, but more important, by so doing, the storage life was considerably reduced, and in the case of the Granny Smith variety, Bitter Pit development was greatly increased. On the other hand, by use of the oil wrap, Superficial Scald could be completely overcome. Most Granny Smiths are now oil-wrapped, but the delayed storage practice still persists.

Under Victorian conditions, prompt storage should be practised. Superficial Scald in Granny Smiths usually does not become of economic importance until September. Fairly large quantities of Granny Smiths are marketed throughout the year, and it is a needless expense to wrap that portion of the Granny Smith crop which is to be marketed before September. On the other hand, no Stewarts are oil-wrapped. This variety is also very subject to Superficial Scald, and it is suggested that a portion of the Stewarts, i.e., the portion to be marketed after September, be oil-wrapped.

Of the dessert varieties the Jonathan is the most important, and presents various problems. An immature Jonathan, ground colour green, stores well, but lacks both quality and red blush. Hence, Jonathans are seldom picked at that stage of maturity. When fully-blushed, they are generally very advanced in maturity (ground colour yellow). They are also then fairly soft instead of being crisp and juicy, and have a short storage life. To combine reasonably long storage life with reasonable quality, the Jonathan should be picked with the ground colour green-yellow. The Jonathan is in that condition for a period of about three weeks, i.e., the last three weeks in March, and Jonathans picked after then are suitable for short storage only, and should be marketed first.

Formerly, the storage of Jonathans was frequently attended by considerable loss, due to the development of storage disorders, such as Soft Scald and Breakdown. These are low temperature disorders, and a technique of temperatures for overcoming these disorders has been evolved. This technique consists of holding the Jonathans not below 36 degrees until the end of April, after which the temperature can be lowered to 34 degrees during May and to 32 degrees from June onwards. Most stores' engineers were familiar with this technique and were adopting it. Others were adopting it more or less unintentionally, for with limited capacity of refrigerating plant, considerable time elapsed before they were able to reduce temperatures even to 36 degrees. Last season, in great contrast to previous experience, the losses through Scald and Breakdown development in Jonathans were negligible. Jonathan Spot, which if not too severe is of minor importance, was frequently observed in late-picked Jonathans and in Jonathans nearing the end of their storage life.

After mid-September the Jonathan is very subject to both Jonathan Spot and to mould attack, besides having lost flavour and crispness, simply because it has reached the end of its storage life. Lines showing even small losses due to mould attack in storage will show very large losses during the marketing period, and from all angles it is most unwise to push the storage of Jonathans to the limit (and beyond) when other varieties with longer storage life are available.

The other coloured varieties, such as Delicious, Rome, Statesman, Democrat, and Yates, are not subject to low temperature disorders like the Jonathan, and for long storage should be stored at 32 degres from the commencement. Indeed, it is only by immediate storage at low temperatures (32 degrees) that these varieties can be kept in good order until late in the year. These varieties have a storage life longer than that of the Jonathan, the Democrat and Yates having a much longer storage life than the other three varieties. The order of removal from storage should be Delicious, say, up to one month after the Jonathan, Rome and Stateman up to two months after the Jonathan, and Democrat and Yates up to three months after the Jonathan.

When stored to the limit of their storage life, both the Delicious and Rome are subject to Superficial Scald, and it is suggested that a small percentage of these two varieties be oil-wrapped and reserved for long storage.

Under the above scheme, the market can be supplied with coloured varieties until the end of the year, but it should be stressed that from mid-September onwards each variety in turn is reaching the end of its storage life, and hence the apples are then possessed of very little quality, although they may be still of excellent appearance.

On the other hand, mainly because it is picked in the immature condition (ground colour green), the Granny Smith is still possessed of reasonably good quality during the October–November–December period, and it would appear highly desirable to reserve as large a proportion as possible of the Granny Smiths for the end of the year trade. With prompt storage at low temperatures (29 to 32 degrees), and oil-wrapped, the Granny Smith can be kept in surprisingly good condition right up till December.

In local gas storage trials with apples, it has been found that the Granny Smith variety responds remarkably well to this form of storage; indeed, Granny Smiths removed from gas storage in December have been in a condition scarcely differing from that of freshly-picked apples.

There would seem to be great scope for the local gas storage of Granny Smiths to be held for the November–December trade.

Finally, there is the problem of storing mixed fruits in the one store. A store may be required to store (*a*) pears, (*b*) green apple varieties, (*c*) Jonathan apples, (*d*) other apple varieties. As pointed out previously, these various classes of fruit require different storage temperatures, and where possible should be stored separately. Nevertheless, storage space cannot be wasted, and a certain amount of mixing becomes necessary. However, in stores with several chambers, it is suggested that one or more chambers be set apart for pears and run at 29 degrees. If it is not possible to fill a chamber with pears, the remaining space could be filled with green apple varieties like Granny Smith or Stewart and still run at 29 degrees. If unable to fill up with the green apple varieties, then, of course, some other variety would have to be used, but not Jonathan. It should be stressed, however, that the presence of the mature coloured varieties will shorten the life of the pears, which would therefore be suitable for short storage only.

If there is no option but to store Jonathans with pears, then the storage temperature must be raised to suit the Jonathan, otherwise many Jonathans will be lost owing to low-temperature disorders developing. The higher temperature will considerably reduce the storage life of the pears, as will also the ethylene gas from the ripening Jonathans. However, this need not result in any loss with the pears, provided they are marketed first.

Where Jonathans are stored in quantity they should be stored apart from other varieties at the recommended temperatures. *If it is necessary to fill up a "Jonathan" chamber with other apple varieties, the temperatures should be maintained to suit the Jonathan.* Such temperatures would result in very little, if any, reduction in the storage life of other varieties. Apart from "pear" chambers and "Jonathan" chambers, there may be other chambers filled with apples. Such chambers could best be run at 32 degrees from the start so as to obtain maximum storage life.

Summary and Recommendations

The storage of pears presents more difficulties than the storage of apples. The storage life of each pear variety is definitely limited, and when overstored the pears develop disorders during marketing. It is suggested that closer attention be given to the limitations to storage life of pears according to variety and cool store facilities (as set out in the text), and that these limitations be not exceeded.

Great differences exist in the capacity of the various cool stores to maintain uniformly low temperatures as are necessary for the long storage of pears. It is recommended that for long storage certain stores only be chosen.

Even in the best stores it is very difficult to hold pears until October–November–December. It is possible, however, by means of gas storage (up to 8 per cent. CO_2), to hold the Packham, Cole, and Nelis varieties until such times, i.e., Packhams until October, Coles until November, and Nelis until December. It was found that a few stores are sufficiently gas-tight to hold gas without structural alterations. It is recommended that some such stores be especially reserved for long gas storage. They should be promptly filled with Packhams, Coles,

and Nelis, closed up and the atmosphere controlled at 5 to 8 per cent. CO_2 and a temperature of 29 degrees until October, when they could revert to an ordinary air store at 29 degrees, and the fruit drawn on for marketing.

Pears should be stored by themselves at 29 to 31 degrees, and should be stored as promptly as possible after picking. If it is necessary to fill up a pear chamber with apples, then green varieties like Granny Smith or Stewart should be chosen, but not mature coloured varieties which give off ethylene gas, which shortens the life of the pears.

Temperatures in Melbourne from April onwards are too low for pears ex cool store to ripen normally. It is recommended that all pears ex cool store from April onwards be ripened at controlled temperatures, 65 degrees for Bosces and 60 degrees for other varieties, the ripening period taking approximately one week. A small percentage of the 1942 pears were so ripened, with highly satisfactory results.

Where ample grading facilities exist, it is recommended that "coloured" apples (which are usually fully mature) be graded for size prior to storage, but if grading cannot be carried out expeditiously then it would be better to store the apples promptly as received and grade them later in the year when convenient.

Jonathan apples are subject to Soft Scald and Breakdown if stored at too low a temperature during the early months of storage. Jonathans should be stored not below 36 degrees until the end of April, after which the temperature could be safely lowered to 34 degrees during May, and to 32 degrees thereafter. In stores where Jonathans are received in quantity, they should be segregated from other varieties and stored at these temperatures. Other varieties store best at 32 degrees from the start. Where it is necessary to fill up a Jonathan chamber with other varieties, the temperatures adopted should be those suited to the Jonathan. Jonathans should not be stored with pears at pear temperatures. Such temperatures (29 to 31 degrees) are much too low for Jonathans.

Several apple varieties are subject to Superficial Scald when stored after, say, September. The most susceptible varieties are Granny Smith, Stewart, Cleopatra, Delicious, Rome. The disorder may be overcome by the use of the oil wrap. This is at present used on *all* Granny Smiths, which is an unnecessary expense. It is suggested that the wraps be used only on that portion of the Granny Smiths which it is intended to store beyond August. On the other hand, it is suggested that, say, 20 per cent. of the Stewart, Cleopatra, Delicious, and Rome be oil-wrapped for holding from September onwards. None of these varieties is oil-wrapped at present.

It is recommended that all varieties be cool stored as promptly as possible after picking. At present, many Granny Smiths and Stewarts are subjected to delayed storage, which thereby reduces storage life.

There is at present a real difficulty in supplying quality apples during October–November–December. The Granny Smith variety is most suited for supplying the market at that period, and it is suggested that as large a proportion as possible of the Granny Smiths be held for marketing during that period.

The condition of the Granny Smith for late marketing could be greatly improved by the adoption of gas storage (5 to 8 per cent. CO_2). This would be possible without structural alterations in some stores. It is recommended that in such stores chambers be set aside for the gas storage of Granny Smiths. When the chamber is filled, it would be kept closed until October, when it would revert to an ordinary air store; in the meantime, the CO_2 gas being controlled at the 5 to 8 per cent. level. Oil-wrapping would be essential.

Fertilizer Registrations and Unit Values for 1943

Unit Values and Registrations under the Fertilizers Act, which are usually gazetted in December each year, and appear in the January issue of this Journal, are delayed this year because of the proposal to extend price fixation to the animal fertilizer section.

It is hoped that the matter will be finalized in time for the figures to appear in the February issue.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	69	Longerenong Agricultural College	Dooen	43
Banyule Stud Pty. Ltd.	Wangaratta ..	42	McNabb and Son, G. A.	Irrewillipe East ..	177
Black, I. S., Estate ..	Mount Noorat ..	52	Northcote Children's Farm	Bacchus Marsh ..	156
Clarke, A. B. ..	Glenormiston South	16	Onley, W. H. ..	"Glenholme," Caldermeade	50
Dennis, Mrs. A. A. ..	Frankston ..	33	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Dookie Agricultural College	Dookie	77	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Powell, T. S. ..	"Carellen," Mansfield	46
Geelong Grammar School	Corio	56	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	36
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	29	Samuel, Misses G. and E.	Lang Lang ..	48
Gorman, A. W. ..	"Cathcart," Alexandra	61	School of Horticulture	Burnley	9
Hollaway, R. W. ...	Caldermeade ..	72	State Experiment Farm	Rutherglen ..	40
Kilmany Park Farm Home for Boys	Sale	94	State Research Farm	Werribee	229
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	Wells, W. G. ..	Caldermeade ..	65

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Andison, J. A. ..	Thomastown ..	43	Child, G. P. ..	Epping	53
Andrew, J. C. ..	Whittlesea ..	121	Christian Bros. ..	Doreen	41
Andrew, W. ..	Whittlesea ..	160	Clark, P. W. ..	Whittlesea ..	62
Andrews, E. H. ..	Templestowe ..	19	Clements, M. and L., and Son	Bundoora ..	135
Balharrie, J. A. ..	Whittlesea North ..	59	Cobain, J.	Thomastown ..	40
Barclay, A. H. ..	Whittlesea ..	107	Collins, L.	Doreen	74
Barling, J. ..	Mernda	39	Cornfoot, D. H. ..	Whittlesea ..	25
Batten, R. J. ..	Wollert	44	Cotchin, J. ..	Woodstock ..	18
Bebbington, J. ..	Whittlesea ...	92	Coulthard, J. J. ..	Whittlesea ..	66
Benson, R. ..	South Morang ..	28	Craker, Mrs. E. ..	Warrandyte ..	2
Bodycoat, A. ..	Wollert	39	Cumming, H. R. ..	South Morang ..	20
Booth, Mrs. A. ..	Warrandyte ..	8	Cunningham, E. C. ..	Templestowe ..	23
Bourke, G. J. ..	Fairfield	82	Danaher, J. V. ..	Whittlesea ..	63
Bradbury, A. K. ..	Diamond Creek ...	31	Danns, N. C. ..	Whittlesea ..	34
Buckley, F. J. ..	Mernda	104	Deutscher, H. W. ..	Mernda	168
Bunting, J. ..	Epping	35	Deveny, M. ..	Bundoora ..	51
Butler, W. ..	Wallan	49	Draper, L. S. ..	Wollert	31
Callaghan, L. ..	Epping	34	Drysdale, J. C. ..	Warrandyte ..	41
Callaghan, T. F. ..	Thomastown ..	40	Evans, Miss M. ..	Bundoora ..	29
Carr, W. J. ..	Wollert	65			

TUBERCLE-FREE HERDS—*continued.*

Name.	Address.	Number in Herd at Last Test.
Fellows Bros.	West Heidelberg	52
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Fox, A.	Mernda	59
French, T. W.	Wollert	43
French, W.	Greenvale	51
Galbraith and Walker	Greensborough	36
Gamble Bros.	Greenvale	156
Gallus, E. A.	Doncaster	11
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	28
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	27
Harding, J. E.	Templestowe	42
Hargreave, Mrs. E. J.	Whittlesea	21
Harkness, H. J.	South Morang	31
Harmer, R. E.	Wollert	38
Hawkes, Miss D.	Warrandyte	19
Hehr, H.	Epping	32
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	6
Hobbs Bros.	Heidelberg	65
Howden, A.	Epping	29
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	7
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	35
Junor, G. M.	South Morang	37
Kell, W. E.	Greensborough	21
Lay, P.	Alphington	30
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McDonald, A. J.	Whittlesea	2
McDowell, R. H.	Greensborough	28
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Mason, N.	Donnybrook	52
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	5
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	36
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	38
Norton, O. G.	Bundoora	37
O'Hern, T.	Epping	58
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Patullo, F. E.	Mickleham	36
Pettit, W. H.	Thomastown	36
Pitson, R. H.	Yarrambat	17
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	49
Rawlings, J. H.	Whittlesea North	41
Righetti, L. A.	Lower Templestowe	40
Robson, Mrs. G. A.	South Morang	47
Rodgers, E.	Whittlesea North	11
Rosewarne, Miss P.	Yan Yean	43
Seeber, B.	Thomastown	24
Shanks, John	Mernda	73
Sheeky, A. A.	Templestowe	14
Short, E.	East Preston	99
Siebel, F.	Thomastown	26
Simpson, W. G.	Donnybrook	12
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	73
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	31
Southon, H. W.	South Morang	27
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Tarry, J.	South Morang	24
Thomas, Mrs. E.	Broadmeadows	11
Thomas, W. C.	Yan Yean	31
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Vallence, C. A.	Epping	11
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	18
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	33
Williamson, J.	Doncaster (High-street)	5
Willis Bros.	Craigieburn	61
Wilson, J. E.	Diamond Creek	35
Wilson, Mrs. M.	South Morang	14
Wood, A. V.	Yan Yean	125
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Young, Mrs. A.	Wollert	33
Ziebell, H.	Thomastown	32

There are also 408 herds in which 11,690 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Oats for Grazing in the Mallee

Results at Walpeup

By H. J. SIMS, M.Agr.Sc., Manager, Mallee Research Station, Walpeup

Merino ewes and their Crossbred lambs on the Mallee Research Station.

"ON the present outlook of the war, it is desirable that mutton and lamb production in Victoria should be maintained to meet the requirements of the armed forces, civilian population, and expected demands for export to Great Britain and elsewhere. At the same time, maximum production of beef and pigmeats is essential." The foregoing is portion of an official policy statement published in the December issue of the *Journal of Agriculture* in an article entitled "Maintain Meat Production." The article suggests that a considerable increase in the sheep population of the cereal areas of the State, including the Mallee, might be made.

When increased sheep numbers are considered, feed is the first consideration, therefore each farmer should plan to supply his sheep with adequate feed at all times of the year. To do this, he cannot depend solely on grazing from stubbles, fallows, and volunteer pastures, and must augment food supplies by the cultivation of some fodder crops, and also institute a scheme of fodder conservation.

At the Mallee Research Station, Walpeup, experiments with various sown fodders and pastures are in progress, but as a source of grazing for fat lamb production, none of the fodder crops available at present has proved more satisfactory

than oats, which can be utilized in so many ways for stock. The crop can be grazed out completely during the winter and spring; it can be grazed early in the year, and if a suitable variety is used, a good recovery for grain can be obtained. The crop can be allowed to mature for grain, hay or silage (ungrazed) for fodder conservation; or after grazing the crop can be left unharvested, and used for fodder, during the summer and autumn.

At the moment, with the manpower position as it is, the easiest form of fodder conservation is oats as grain. A properly planned fodder conservation scheme should have two objectives—a reserve for drought periods, and fodder for supplementary feeding at lean times of the year.

Results of Trials—Nearly Two Ewes and Lambs per Acre for Four Months

The trials at Walpeup are designed to test oat varieties for two purposes, namely: (*a*) complete grazing, and (*b*) recovery after an early grazing. Such matters as rate of seeding, manuring, seed size, and the possibility of the use of other cereals for grazing have been investigated. The carrying capacity of some oat crops on the station is worthy of note. In 1941, a paddock of 100 acres, divided into three sections and grazed in rotation, wholly maintained 180 ewes with 100 per cent. lambs from the beginning of July to the end of October, by which time all the lambs were sold. Late rains were received in that year, and portions of the area recovered well enough to be stripped, yielding approximately 250 bags of oats. The areas too light for stripping provided sufficient feed to keep 100 ewes until the beginning of March. In 1942, the area was sown to oats again, and a larger amount of feed provided, but as there were approximately 370 ewes and lambs, other grazing was used, and comparable figures are thus not available.

Oats for Complete Grazing

Oats for grazing trials have shown that the early maturing upright growing oats, e.g., Mulga or Gidgee, give the most feed early in the season, and that the later varieties, e.g., Algerian or Algeribee give a better recovery after early grazings and provide more feed at the late grazings. Other varieties, of midseason maturity, do not give as much feed at the early grazing as the Mulga type, nor as much at the late grazing as the Algerian type. However, they are better than Algerian at the early grazings, and better than Mulga at the late grazings, and superior to either at the August-September grazings, thus giving higher greenstuff yields over the whole year. Oats in this class are Dawn, Fulghum, and Guyra.

When sowing oats with the objective of grazing out completely, it is advisable to sow more than one variety, so as to ensure greatest production throughout the year. Algerian is at present the most commonly grown variety in the Mallee, but early and midseason varieties will provide more winter feed. Varieties recommended include Mulga, Gidgee, Dawn, Guyra, Fulghum or Belar.

When grazing, the best plan is to fence the oats into conveniently sized paddocks, if wire is available, and to feed off each area in rotation, resting them until a recovery and sufficient regrowth for grazing is made. Grazing at approximately monthly periods should be possible.

Oat variety grazing trials. Left—Ungrazed. Right—Grazed.

Recovery after Grazing

It is a common practice to graze oats in the winter then to let them mature without further grazing. The nature of the season following the winter grazing will determine the use to which the crop is put—whether it is cut for hay, stripped for grain, or not harvested at all but let go for sheep feed (dry feed).

In 1937, it was adopted as a standard experimental practice that one section of the oat variety trial on stubble should be grazed in July, and the subsequent recovery yield of

grain recorded. The yields of the varieties tested over the whole period are given in Table 1, while, to give a comparison of a wider range of varieties, the results of the first three years of the trial also are included.

The varieties in the table are arranged in their normal order of maturity. It will be seen that the early and midseason varieties have produced the greatest amounts of green feed at this July grazing. The subsequent grain yields of all varieties have been seriously reduced (about 50 per cent.) by grazing, but some are reduced less than others. Reduction in yield also depends on seasonal factors. However, the sheep feed is very valuable, and the practice of grazing is recommended.

Visitors inspecting the experimental plots at Walpeup.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth; with oats sown early in May this occurs about the end of July for early varieties at Walpeup, and about a month later for Algerian. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn. It has been found that the grain yield of Fulghum is less affected by grazing than that of Dawn.

Rate of Seeding and Manurial Treatment

Rate of seeding is one of the most important factors in the sowing of oats for grazing. Much more green feed is obtained when the heavier sowing rates are adopted. This is very clearly illustrated in Table II., on the next page, which sets out the average of all varieties in the oat grazing trial.

Rates of seeding now adopted at Walpeup and recommended are 40–50 lb. per acre when the crop is not to be grazed, and 70 to 80 lb. per acre depending on seed size when grazing is intended.

TABLE 1.—RECOVERY OF OATS AFTER GRAZING.

	Average Yield, Six Years, 1937–42.			Average Yield, Three Years, 1937–39.		
	Greenstuff July.	Grain Ungrazed.	Grain Grazed.	Greenstuff, July.	Grain Ungrazed.	Grain Grazed.
	cwt./ac.	bus./ac.	bus./ac.	cwt./ac.	bus./ac.	bus./ac.
Mulga	14·3	16·5	8·4	18·7	21·6	11·0
Palestine x Dawn R. 4.1.1 ..	14·6	19·7	11·8	19·5	26·4	16·4
Gidgee	..	..	..	20·2	21·3	12·1
Burke	..	..	..	17·1	24·3	12·5
Early Kherson	..	..	..	17·2	24·8	11·0
Fulghum	14·2	16·3	12·1	19·7	21·9	16·4
Dawn	14·2	16·3	8 6	18·0	21·3	9·6
Guyra	..	..	..	19·1	24·3	10·7
Lachlan	..	..	..	18·3	22·6	10·1
Ideal	..	..	..	15·2	23·2	13·5
Palestine x Dawn R. 46.2.1 ..	11·8	18·0	10·4	17·8	24·9	12·5
Algeribee	..	..	..	18.4	21·6	10·6
Algerian	11·8	16·2	9·2	16·0	21·8	10·9

General view of rotation field at the Mallee Research Station.

TABLE II.—YIELD OF GREENSTUFF.

Oat Rate of Seeding Trial, Average Four Years, 1938–41.

Rate of Seeding.	Yield of Greenstuff.
	cwt./ac.
25–30 lb. per acre (5½ grains per ft.) ..	13.6
50–60 lb. per acre (11 grains per ft.) ..	15.8
75–90 lb. per acre (16½ grains per ft.) ..	20·1

There are large variations in the size of the grain of different oat varieties. This factor should be borne in mind when deciding the seeding rate to be adopted. For example, the grain of Burke is approximately 30 per cent. smaller than that of Mulga, and to give comparable seeding rates, Mulga would be sown at 60 lb. and Burke at 40 lb. of seed per acre.

Experiments indicate that the use of manures sown with the oats on stubble, to increase the amounts of grazing provided, is not justified under Mallee conditions.

Other Cereals for Grazing

The fact that other cereals may give more grazing than oats has not been overlooked, and trials with the four main cereals—wheat, oats, barley and rye have been included. In addition various mixtures have been tested. Results from these show that, for green feed alone, ryecorn, and mixtures containing ryecorn, have out-yielded all other cereals. Although rye has out-yielded oats for green fodder, it is not to be preferred to oats for grazing if the crop is to be allowed to ripen for hay or grain. If grazing alone is desired, ryecorn merits serious consideration, although it tends to become coarse late in the season. Also, the fact that it may become an impurity in the subsequent wheat crop must not be overlooked.

Early and mid-season oat varieties have proved superior to the wheat and barley varieties tested, although barley varieties have proved better for early feed than late oat varieties. When considering comparisons between different cereals, it must be realized that it may be possible to obtain bigger differences between varieties than between cereals.

Summary and Conclusions

The Mallee wheat districts should and can carry more stock than formerly, but more and special consideration must be given to the growing of fodders, and to fodder conservation.

The oat crop is the most satisfactory at present available for grazing in the Mallee cereal areas, and for providing material for fodder conservation.

Oats for grazing should be sown early in the season. If sown dry, they will come away with the first rain, and provide early winter feed.

For complete grazing, earlier maturing varieties will provide more early feed, and total bulk of feed, than Algerian. For best results more than one variety should be sown. Seed should be obtained immediately.

Varieties differ in their power of recovery after grazing, but, to enable a satisfactory recovery, grazing should be discontinued before upright growth commences. Seasonal conditions also will affect recovery after late grazings.

When oats are sown for grazing, a heavier rate of seeding than normal should be adopted. Up to 70 or 80 lb. per acre is warranted. There are large variations in grain size, and this should be borne in mind when planning the rate of seeding. The use of manures with oats on stubble is not justified.

Ryecorn has out-yielded oats for green fodder, and is worthy of a trial for this purpose, but it is not to be preferred to oats if the crop is to be allowed to recover for harvesting for hay or grain.

FEEDING CEREALS TO PIGS

Whole v. Crushed Barley

Demonstration No. 4.—Rutherglen Experiment Farm

By N. C. KILLEEN, B.Agr.Sc., Science Field Officer

EXPERIMENTS carried out in 1941* on the feeding of wheat to pigs showed that the whole wheat could be self fed to pigs from the weaner stage onwards without undue waste, and that the slight advantage given to pigs fed crushed wheat was offset by the cost of crushing. Following these investigations, it was decided to conduct a similar experiment, using barley instead of wheat, and, in the autumn of 1942 a series of experiments was conducted to allow a comparison to be made between whole and crushed barley when self fed to pigs.

Under the conditions of this experiment it was shown to be more profitable to feed crushed barley than whole barley.

Self-fed pigs on a Victorian farm.

The Experiment

The experiment was conducted in three sections. The pigs used were Large White-Middle White crossbreds tending to baconer rather than porker type. The various groups were run in bare yards of similar size. Each yard contained a shelter of simple design with an earthen floor, and the water supply to each was automatic.

Section 1.—Two litters were randomized into two groups; (*a*) self-fed whole barley; (*b*) self-fed crushed barley. Average weight at the commencement was approximately 106 lb., and the experiment continued for 36 days, commencing on 16th February, 1942, and finishing on 24th March, 1942.

Section 2.—Three litters were randomized into two groups as for Section 1, fifteen pigs in each group, with an average weight at the commencement of approximately 74 lb. Experiment commenced on 16th February, 1942, and finished on 7th April, 1942, a total of 49 days. In Sections 1 and 2 the pigs were fed meatmeal as a supplement, at the rate of 10 per cent. of the barley consumed, until they reached an average live weight of 120 lb., and 5 per cent. from then on.

Section 3.—At the completion of the test in Section 2, some of the pigs used in Sections 1 and 2 were re-allotted into two groups of sixteen, again with approximately equal average weights, to determine whether the results would differ when older pigs were used. These pigs were fed 5 per cent. meatmeal as a supplement

Jnl. Agr. Vic., Sep. '41, p. 423; and Nov. '41, p. 554.

and, in addition, small amounts of lucerne chaff were fed to compensate for lack of green pasture. Neither green pasture nor lucerne chaff was available to Sections 1 and 2. Experiment commenced on 7th April, 1942, and finished on 12th May, 1942—period 35 days.

The accompanying table shows the average weights and grain consumption for the three sections. The figures agree in general features, each section showing a significant advantage to the pigs fed crushed grain. There was considerable variation in the weight gains and grain consumption of the three sections. The reasons for this are not entirely apparent, but are probably due to variation in the ages of the pigs used, and the fact that the experiments were not all conducted at the same time, the weather influencing the rate of growth at various times.

In this demonstration the extra gain from crushing the barley in the three sections was 3·01 lb., 2·37 lb., and 2·26 lb. of dressed pork respectively for each bushel of grain used.

This figure is obtained by calculating the live weight gain per bushel of grain consumed and then estimating the amount of dressed pork produced. The difference of pork produced from a bushel of whole and a bushel of crushed grain gives the extra gain derived from crushing.

The wide variations between the grain fed per lb. gain in weight figures within each section indicated that there was considerable waste of grain when fed whole.

From these experiments, the conclusion may be drawn that barley fed to pigs should be crushed.

TABLE OF RESULTS.—BARLEY EXPERIMENT, RUTHERGLEN EXPERIMENT FARM

	Section 1.		Section 2.		Section 3.	
	Whole Barley.	Crushed Barley.	Whole Barley.	Crushed Barley.	Whole Barley.	Crushed Barley.
Number of pigs in group	8	8	15	15	16	16
Number of days in experiment	36	36	49	49	35	35
Average weight at start	107·4 lb.	105·8 lb.	75·7 lb.	73·7 lb.	145·9 lb.	150·4 lb.
Average weight at finish	133·3 „	145·1 „	116·1 „	144·0 „	173·2 „	195·3 „
Total gain in weight	207·0 „	315·0 „	606·0 „	1,054 „	438 „	754 „
Average gain per pig	25·9 „	39·4 „	40·4 „	70·2 „	27·4 „	45·8 „
Barley consumed	1,110 „	1,155 „	2,370 „	3,256 „	2,529 „	3,096 „
Meatmeal consumed	76·0 „	77·5 „	185·7 „	241·5 „	126·5 „	151·3 „
Grain consumed per day per pig	3·85 „	4·01 „	3·22 „	4·42 „	4·51 „	5·53 „
Gain per pig per day	0·72 „	1·09 „	0·82 „	1·43 „	0·78 „	1·31 „
Lbs. grain per lb. live weight gain	5·36 „	3·66 „	3·91 „	3·09 „	5·77 „	4·2 „
Total weight at finish	1,066 „	1,161 „	1,742 „	2,160 „	2,772 „	3,141 „
Dressed weight	746·2 „	812·7 „	1,219·4 „	1,512·0 „	1,940·4 „	2,198·7 „
Live weight gain per bushel of grain	9·33 „	13·63 „	12·79 „	16·18 „	8·66 „	11·88 „
Estimated dressed weight per bushel of grain	6·53 „	9·54 „	8·95 „	11·32 „	6·06 „	8·32 „
Increased gain of dressed pork per bushel of grain	..	3·01 „	..	2·37 „	..	2·26 „

HELP YOUR NEIGHBOUR - - - UNITY IS STRENGTH

Fertiliser Registrations and Unit Values for 1943

As the fixation of prices for the animal fertilizer section is not yet complete, the publication of the annual list of registrations and the unit values for 1943 under the Fertilisers Act is still further postponed.

It is anticipated that the list will appear in the March issue of the *Journal*.

THE FRUIT GROWER AND FERTILIZER RATIONING

By C. E. COLE, B.Agr.Sc., Horticultural Research Officer and G. W. GAYFORD, B.Agr.Sc. Assistant Horticultural Research Officer

A green crop of Blue Lupins in a young lemon grove at Croydon.

UNDER present conditions of scarcity of all types of fertilizers and the reservation of a large proportion of artificial fertilizers for vegetable crops, fruitgrowers are unable to secure the quantities to which they have been used in the past. Consequently, there is a danger that fruit trees will sooner or later decline in productivity unless orchardists make the best possible use of available supplies. Most fruitgrowers are fully aware of the value of farmyard manures, and are already using all they can obtain.

Limited quantities of sulphate of ammonia, nitrate of soda, superphosphate, and blood and bone fertilizer may be made available to fruitgrowers from time to time, according to the supply position. These would be allotted firstly according to the national need for the particular kind of fruit, and, secondly, according to its nitrogen requirements. For instance, while both citrus and dried vine fruits may be of high priority, citrus trees are more rapidly and seriously affected by nitrogen shortage than are vine fruits, and so for a time would receive priority in nitrogen fertilizers.

Nitrogen Starvation

Nitrogen shortage in the soil causes the leaves of fruit plants to lose the dark green colour of good health and become light green and, eventually, yellow-green and small. New growth becomes less and weaker, and eventually the yield of fruit is reduced.

In light soils and where only artificial nitrogen fertilizers have been used, nitrogen will become reduced in a year or two in the absence of fertilizers. In heavier soils and where bulky organic manures have been used in addition to artificial fertilizers, and where leguminous crops are grown,

March planting of the green crop gives best results. Field peas in citrus at Mildura.

nitrogen shortage will not occur for a much longer period after artificial nitrogen fertilizers are reduced or stopped.

Nitrate of Soda

Nitrate of soda is more likely to be available to fruitgfowers than is sulphate of ammonia. The former is, of course, a valuable source of nitrogen, and of most use to the tree or vine when applied in the spring, but can be applied with benefit as late as December, and for citrus an early autumn dressing can be used by the trees. It is quick in action, and fairly readily washed out of the soil by water. Under irrigation conditions, therefore, it is better to apply it in two smaller dressings rather than in one large dressing, or it may be applied in the irrigation water.

Unfortunately, because of its soda content, it is not suitable for continued use on soils which have a tendency to develop salt troubles. For most Victorian soils, other than Murray Valley soils from Swan Hill to Mildura, it is a suitable fertilizer, and even on those soils one or two moderate applications will not be harmful.

At present the unit cost of nitrogen in nitrate of soda is not very much greater than in sulphate of ammonia, and under most conditions, nitrate of soda is just as suitable for fruit trees and vines as sulphate of ammonia.

Sulphate of Ammonia

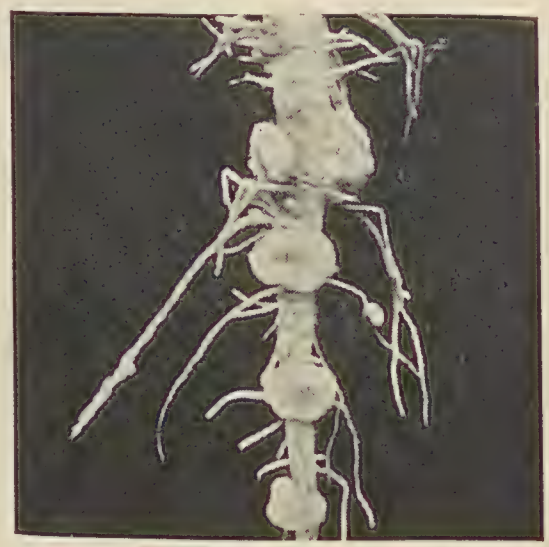
Sulphate of ammonia has been the usual source of nitrogen for fruitgrowers, indeed, their most important fertilizer, for some years. It is now severely restricted, and if any is made available to orchardists, it is likely to be limited to those on soils unsuitable for the use of nitrate of soda. It is best applied in spring, but it can be used with advantage as late as December, and with citrus trees an early autumn dressing appears to be of some benefit.

Superphosphate

It has been proved again and again that superphosphate used as a spring dressing for fruit trees and vines is of no benefit to them. Any "super." made available should be used to improve the growth of green crops sown in the autumn, or of volunteer leguminous plants, such as trefoil, which may be present among the trees. The use of "super." in this way increases the nitrogen content of the soil in the following spring, and so is of ultimate benefit to the trees. The "super." available should be spread uniformly over the area in which the crop is growing, because green crop plants respond even to light dressings of phosphate.

Blood and Bone

Blood and bone manure contains a much lower percentage of nitrogen than either sulphate of ammonia or nitrate of soda, and at least three times the quantity must be used to produce the same effect. The nitrogen supplied by the blood is in a slowly available form and is not readily leached out of the soil. Therefore, in order that



The nitrogen "factories" of a legume—root nodules on a Blue Lupin plant.

the nitrogen might be in a form readily available to the trees or vines when growth commences, it is advisable to apply the blood and bone manure three or four weeks before this period.

The bone is a very slowly available form of phosphate and, like superphosphate, is of no direct benefit to the trees, but it may stimulate the growth of a green crop sown in the following autumn.

Green crops should be turned in about the end of August.

The Use of Small Quantities of Fertilizer

It is unlikely that enough fertilizer for normal dressings will be available for all fruit crops during the war. It is possible that the amounts available will not maintain full production. In some cases the small amount available may be rationed on an acreage basis, with the result that apparently inadequate quantities per acre might be issued. As stated above, where superphosphate is used with a green crop, it should be distributed evenly over the area in which the crop is sown, no matter how low the rate per acre. With nitrate of soda and sulphate of ammonia, it would not be worth while applying quantities less than 1 cwt. per acre. With blood and bone manure, quantities less than 3 cwt. per acre would scarcely be effective.

When a small quantity of nitrogen fertilizer is obtained, it should not be applied to the whole area upon which the ration is based, but to a selected portion of the orchard or vineyard where it is likely to yield the best return. For example, the fertilizer might be concentrated on an area already showing the effects of nitrogen shortage, on an area of light soil, or on the more profitable varieties. If the orchard is uniform, the fertilizer may be applied to sections of it in rotation.

The Green Manure Crop

The shortage of nitrogenous fertilizers has made the importance of the leguminous green crop much greater than usual. Normally it is a cheap way of increasing the nitrogen in the soil, as well as an improver of soil texture. For many growers it has now become the only means of maintaining soil nitrogen. A good crop may provide the equivalent of three to four hundredweight of sulphate of ammonia per acre.

The green crop must be a legume crop, e.g., tick beans, field peas, tares, vetches, lupins, fenugreek, trefoil, clover, or other similar plants. Only leguminous plants are capable of taking the nitrogen of the air and converting it to a form which other plants can use. Cereal or grass crops *cannot* increase the total amount of nitrogen in the soil.

The cheapest way to grow a useful green crop is to encourage with superphosphate the volunteer trefoils and clovers which appear naturally in many orchards in the autumn. If the orchard is not ploughed in the autumn, quite a heavy cover can be obtained in this way. These plants are encouraged also by liming the soil. In some cases where the plants do not occur naturally, seed may be introduced.

Where there is no ready means of encouraging volunteer plants, the green crop must be sown. Typical standard seedings in the northern districts are tick beans at 1½ bushels per acre with 2 cwt. "super." per acre, and in the southern districts field peas at 1½ bushels per acre with 1 cwt. "super." per acre of green crop. Here again liming will increase the bulk of the crop where the soil tends to be acid.

The most vital point with sown cover crops is early autumn planting. Late planting almost invariably leads to failure of the crop. Both in northern and southern districts the seed should be sown in March, and certainly not later than mid-April. If harvesting of the fruit is not complete at seeding time, only alternate lands can be sown, leaving the remaining lands free for harvesting operations. Usually the final watering in irrigation districts is used to germinate the seed, and the crop will frequently continue successfully with only the natural rainfall to supply moisture. In dry years a late irrigation may be necessary to make the crop grow satisfactorily.

Tick beans grow well in the Goulburn Valley.

The crop is best ploughed in just at the flowering stage, but there is little advantage in doing so before the end of August, because the soil is not warm enough to enable rapid rotting of the plants. If the crop has not reached sufficient bulk at least three weeks before the trees or vines are in full bloom, it should be left until the fruit is set and then ploughed in, provided moisture conditions are favorable. Ploughing in just before blossoming of the trees results in a temporary shortage of nitrogen available to the trees, which may affect the setting of the fruit.

To sum up, the days of "optimum dressings" and "maximum returns" are gone, and "maintenance" is the watchword. The fruitgrower of to-day must use any small allowance of fertilizer very wisely, he must make use of all animal manures within his reach, and he must grow leguminous cover crops each year if he is to maintain his orchard or vineyard in profitable production.

HELP YOUR NEIGHBOUR—MANY HANDS MAKE LIGHT WORK

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen
Bowran, L. G.	"Glendare," Tallangatta
Bright, George H. ..	Dumbalk
Castle, L. H.	Clarinda
Critten, H. S.	Dumbalk
Dookie Agricultural College	Dookie
Doornbusch, John L. ..	"Starpark," Nhill
Fairchild and Clutterbuck	Tinamba
Geddes, L. D.	Bungaree
Hamblin, A. T., & Sons..	Toolleen
Harrison, C. T. ..	"Eastside" Stud, Pomborneit
Hawtin, I. E. and F. ..	"Rossmoyne," Colac
Haywood, Dr. A. R. ..	Hastings
Horn, L. A.	Leongatha North
Longerenong College ..	Dooen
Northcote Children's Farm	Bacchus Marsh
Pietsch, R. E.	Katyil
Rintoul, J. T. C. ..	Glengarry
Roy, W. A.	Morrell's Hill, via Boolarra
Spiers, Albert	Bamawm Extension
State Experiment Farm ..	Rutherglen
Sutherland, R. N. ..	Nullawill
Trenery and Soderlund ..	"Promview," Foster
Trigg, A. J.	Bungaree
Trigg, N. H.	Bullarook
Tweddle, J. T.	"Winlaton," Shepparton
Walch, M. U.	Baring

AVIAN TUBERCULOSIS

By HAROLD E. ALBISTON, D.V.Sc.,
Director, Veterinary Research Institute, University of Melbourne

AVIAN tuberculosis may be considered as a disease with a dual significance, as it is responsible not only for losses among infected poultry, but also its causal organism may infect animals. The disease in birds is closely comparable with mammalian tuberculosis, and is characterized by a wasting sickness.

Avian tuberculosis is widespread, and has been reported from all countries where the poultry industry forms a part of the agricultural activities. It is not uncommon in Victoria, and occasionally is responsible for numerous deaths in an infected flock, although usually there is a history of odd deaths at infrequent intervals. Although statistics on the incidence of avian tuberculosis in Victoria are not available, it would appear that the disease is not as common here as in the old world.

Cause.—The avian tubercle bacillus is closely related to the mammalian forms, but it can be readily differentiated from the human and bovine organisms by the comparative ease with which it may be cultivated artificially, by its more rapid growth, its more uniform staining reactions, and the reaction of small laboratory animals to inoculation with it.

Susceptibility.—Most of the domestic poultry have been found susceptible to natural infection, and the disease has been observed in fowls, turkeys, pheasants, ducks, geese, swans, canaries, parrots, and pigeons. Moreover, it is common in wild birds kept in captivity. Ducks and geese are rarely found infected naturally. It is interesting to note here that parrots are frequently infected with the human type of bacillus, and appear more susceptible to this type than to the avian strain. Canaries also have been found infected with the human tubercle bacillus.

Age Incidence.—Generally speaking, avian tuberculosis is a disease of adult fowls. It is rarely seen in birds under six months of age, while infected fowls under twelve months of age have rarely developed the disease to the extent of becoming spreaders of the infection. This general observation has been used in America to confirm one of the recommendations for the reduction and elimination of tuberculosis from infected flocks.

Fowl showing tuberculosis of the liver. The small white spots on the liver are the lesions caused by the disease.

Symptoms.—The main sign which should lead to a suspicion that a bird is infected with avian tuberculosis is a progressive emaciation and anaemia. Lameness is frequently the first symptom noted. Often one finds the breast muscles completely atrophied with a corresponding prominence of the sternum, which is very evident on handling the birds. The skin, mucosa, comb and wattles become pale through the anaemia. As the disease progresses, affected birds become disinclined to move about, either through extreme weakness or the development of arthritis in one or more joints. Tuberculous arthritis is one of the commoner findings in an infected flock. The appetite may remain good, although towards the end it becomes capricious and finally greatly impaired.

Post-mortem Appearances.—In the majority of cases, the spleen and liver are found to be involved,

the latter organ with slightly greater frequency. The lesions consist of roundish yellow nodules, varying in size from a pin's head to the diameter of a threepenny piece. In well-developed lesions, caseation is found, the cheesy material being readily shelled out. Very early small lesions are whitish or pearly in appearance, and of a crystalline consistence. Calcification is a rare finding in avian tuberculosis.

Frequently the lesions in the liver and spleen vary considerably in size—and when numerous, the affected organ is increased greatly in its dimensions. Next to the liver and spleen, lesions of the intestine and peritoneum are found with fair regularity. The intestinal lesions consist of small tubercles on the submucous layer which enlarge and protrude from the serous surface, and frequently open into the intestines—sometimes they become pedunculated. There may also be isolated ulceration of the intestinal mucous membrane.

The lungs are occasionally involved, and kidney and ovarian lesions may be found. It may be stated as a general rule, however, that tuberculosis in the fowl is primarily an alimentary disease, and that early cases will show lesions in the liver and spleen. With the extension of infection other organs and tissues may become involved.

The long bones may become the seat of tuberculous lesions, and in very rare cases, skin involvement, with tuberculous masses around the roots of feathers may be found. Skin lesions are more commonly seen in parrots and pigeons.

Prevention.—Medicinal treatment is of no value; therefore preventive measures must be adopted. Because of the insidious nature of the disease, and difficulties in diagnosis, isolation of all affected birds is not possible; therefore, the most practical and economical method of procedure is to slaughter the whole flock as soon as the disease is recognized. Birds in good flesh may be used for food if, on examination, the liver or spleen shows no white or yellow spots and provided there are no nodules or lumps on the intestines. When lesions are present the flesh cannot be considered suitable for food.

The poultry yard as well as the houses and coops should be thoroughly cleaned and disinfected before fresh stock is acquired. Disinfection is necessary because of the fact that the bacilli are found in the droppings in great numbers and they may remain alive for long periods outside the body.

The Proper Method of Disinfecting Fowlhouses.

1. Remove all litter from floors, nesting places, and yards, and to avoid contamination of the surrounding soil, burn the rubbish as near the building as possible.

2. The contents of all hoppers, feed bins, and troughs, such as dry mash or other food or grit, should be burnt with the litter. Scald all utensils, pans, &c., using steam, if possible.

3. Remove all nests, movable roosts, windows, and portable fixtures from buildings; thoroughly wash with warm water and soap to which disinfectant has been added, and place in the sunlight.

4. Thoroughly sweep down the inside of buildings so as to remove all dirt, cobwebs, &c., or, if possible, flush them out with a hose. All accumulations of hard droppings should be softened with water and scraped off with a sharp instrument.

Disinfection may now be commenced. Thoroughly spray all buildings, fences, yards, and appliances with a 5 per cent. solution of lysol. Sunlight is the best of all disinfectants, and its free access to all buildings, should be allowed where possible.

Slake some fresh quicklime by adding boiling water (when heat ceases the lime is slaked). Thin to the consistency of milk with boiling water, to which has been added 1 oz. of alum, 1 oz. of powdered glue previously dissolved in hot water, and 4 oz. of lysol for each gallon of completed wash, and strain through two thicknesses of cheese cloth. The easiest method of applying lime wash is by means of a spray pump which can be purchased at a reasonable cost, and can be used for other purposes. In the absence of a spray pump, a white-wash brush may be used, although it is difficult to fill the cracks and crevices without a stream to drive in the solution. These cracks serve as breeding places for ticks and lice, and should be given careful attention. Where an infectious disease such as tuberculosis is present, it is wise to spray the interior at least twice, with an interval of one week between each application. The runs should be covered with quicklime and the surface ploughed up or dug. They should be divided and changed each year, one-half being used for rape or other green crop. If portable houses are in use, they should be moved frequently, as feeding fowls on the same ground year after year results in heavy contamination of the soil. Disinfect in the spring and autumn each year, if possible, and by all means before introducing fresh stock.

JEPARIT

Crop and Fallow Competition, 1942

Report of the Judge—Mr. W. ALTMANN, of Warracknabeal

SITUATED in the extreme north of the Wimmera, the Jeparit district is one of Victoria's important centres of wheat production. Despite the difficulties associated with working varying soil types ranging from heavy black land to light sandy country, district farmers have reached a high standard in their farming methods. Crop and Fallow Competitions have been conducted by the Jeparit Agricultural and Pastoral Society for nearly twenty years, and the lessons learned from the hundreds of entries judged over that period have in no small measure contributed to the sound methods practised to-day through this area.

A well distributed rainfall throughout the growing period was experienced, and, at the time of judging, the crops inspected gave promise of exceptionally good yields. Conditions had favoured a good tillering development, the heads were well filled, and there was practically no sign of disease.

The newer wheats, Quadrat and Magnet, figured prominently amongst the entries and appeared very promising. Both these varieties have been recommended by the Victorian Wheat Advisory Committee for limited sowing on red and black land in the Wimmera. Quadrat is now recommended for sowing in the Southern Mallee also. Although Ghurka is the standard variety for this district, no exhibit of this wheat was shown, probably because the competitors preferred to try the newer varieties on their best areas of fallow. Two entries in the Light Land Section were partly sown with Gluclub, a variety bred at Dookie College by the late Hugh Pye and developed in Western Australia, where it has been a very popular wheat, though now declining in favour of Bencubbin. Gluclub has been grown to a small extent in both Victoria and South Australia, but is now practically out of cultivation in both these States, and cannot be recommended as a suitable variety for any part of the Victorian wheat belts.

There was a considerable variation in the amount of superphosphate used on the competition crops, the dressings ranging from 30 lb. per acre to 96 lb. per acre. This was undoubtedly due to superphosphate rationing, and as the amount of superphosphate available for wheat growers in 1943 will be only half of that obtained last season and, moreover, of a lower fertilizing value, it is of greater importance than ever that the fallows be in first class order for next cropping.

The competition this year comprised three sections—Heavy Land, Medium Land, and Light Land, the aggregate awards for the fallow prepared in 1941 and the crops grown thereon in 1942 deciding the winner of each section.

SECTION G.—AGGREGATE 50 ACRES HEAVY LAND FALLOW 1941, AND CROP GROWN THEREON 1942.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of		Evenness.	Crop Total.	Fallow 1941.	Aggregate Fallow and Crop.
				Weeds.	Disease.				
Maximum Points	—	35	20	15	15	15	100	100	200
E. G. Nuske ..	Magnet and Bobin	32	18	14	14	14	92	96½	188½
W. G. Rodda ..	Quadrat	30	18	14	14	14	90	96	186
A. T. Polack ..	Magnet	29	17	14	14	14	88	94	182

SECTION H.—AGGREGATE 50 ACRES MEDIUM LAND FALLOW 1941, AND CROP GROWN THEREON 1942.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of		Evenness.	Crop Total.	Fallow 1941.	Aggregate Fallow and Crop.
				Weeds.	Disease.				
Maximum Points	—	35	20	15	15	15	100	100	200
L. R. Rodda ..	Quadrat	30	18	14	14	13	89	96	185
T. Parker ..	Magnet	30	16	14	13	13	86	95	181
A. E. McIntosh ..	Quadrat and Ranee 4H	29	16	13	13	12	83	97½	180½

SECTION I.—AGGREGATE 50 ACRES LIGHT LAND FALLOW 1941, AND CROP GROWN THEREON 1942.

Competitor.	Variety.	Yield.	Purity and Tpe.	Absence of		Evenness.	Crop Total	Fallow 1941.	Aggregate Fallow and Crop.
				Weeds.	Disease.				
Maximum Points	—	35	20	15	15	15	100	100	200
A. Twartz ..	Ranee 4H ..	30	18	14	13	13	88	94	182
A. McKenzie ..	Ranee 4H and Glu-club	29	17	13	14	12	85	90	175
G. McKenzie ..	Ranee 4H and Glu-club	29	16	13	14	12	84	89	173

Heavy Land Section.—The winning entry in a very even section was that of Mr. E. G. Nuske, whose crop of Magnet and Bobin promised to yield well. Although this crop had gone down a little with the heavy rains, it was not anticipated that any trouble would occur in harvesting. It was sown during the second week of May with 60 lb. of seed and 30 lb. of superphosphate per acre.

Medium Land Section.—In this section the first award went to Mr. L. R. Rodda with a crop of Quadrat. The exhibit was of excellent type, well headed and practically free from weeds and disease. It was sown late in May with 75 lb. of seed and 45 lb. of superphosphate per acre.

Light Land Section.—First award in this section went to Mr. A. Twartz with a crop of Ranee 4H. The crop was of good type, clean, and with very little disease. Seeding took place in early May, using 60 lb. of seed and 50 lb. of superphosphate per acre.

TETANUS IN ANIMALS

By G. NICOL, B.V.Sc., Veterinary Officer

TETANUS is a disease of animals and man, occurring more commonly in horses and sheep than in other animals.

It is caused by a germ known as *Clostridium tetani*, possessing the ability to form spores which can live for long periods in the soil. Infection commonly takes place when spores are introduced into wounds; for example, castration wounds, operation wounds, or wounds which occur at shearing time, lamb marking, or following parturition. Once the spores have gained access to the animal's body, they do not spread throughout the body, but if conditions are favorable, they multiply at the site of infection and produce a toxin. This toxin attacks the nervous system, producing very marked symptoms.

Symptoms in Horses

A slight stiffness with consequent slight alteration in gait may be the only initial symptom. This rapidly becomes more marked and the animal adopts a trestle-like stance and is unable to turn round or does so with difficulty. The tail is raised and the muscles of the thigh, shoulder, loin, and neck are hard to the touch. The nostrils may be dilated and the lips drawn back from the teeth. Respiration becomes rapid and shallow, the pulse small and hard. Sweating in patches over the body may be quite marked. There is marked excitability and an increased sensitivity to sound and light, and if disturbed the muscles are thrown into increased spasms and the animal may fall to the ground. Where the jaw muscles are involved, it is impossible to open the mouth ("lock-jaw"), mastication ceases and dribbling of saliva may be seen. Sudden jerking of the head upward results in the third eyelid, the pinkish, fleshy membrane at the inner corner of the eye being forced across the eye (*membrana nictitans* reflex), this being a very useful diagnostic sign. For the most part there is no effort made to lie down, but if the animal goes down, the condition is almost invariably fatal, complications such as pneumonia, asphyxia with exhaustion supervening.

In a small percentage of cases, local symptoms only may be evident, for example, muscular spasms may be confined to an area about the site of infection or to one limb only.

Symptoms in Sheep

Unlike horses, sheep usually tend to lie down when affected. There are similar muscular symptoms to those seen in horses, the legs being held well apart resulting in a proppy gait followed by the animal lying on its side with head thrown well back, legs extended and held straight out from the body. The fleshy eyelid is commonly seen halfway across the eye. Deaths frequently occur about the fourth day after infection, but this may vary from three to twenty days.

Treatment

The toxin which is produced by the tetanus organisms rapidly reaches the nervous system and its effect usually cannot be combated once pronounced symptoms are evident. With valuable animals injections of large doses of tetanus antitoxin are often made with the aim of neutralizing any further toxin produced. Due to the very large doses involved, the cost of such treatment is prohibitive for use on any but the most valuable of animals. Drugs such as chloral hydrate, magnesium sulphate, potassium bromide, cannabis indica, or belladonna are sometimes used in conjunction with the injections of antitoxin to alleviate muscular spasms. If treatment of a valuable horse is attempted along these lines the patient should be placed in a darkened loose-box, the floor of which is covered with suitable bedding, preferably sawdust, but not straw. Slinging is useful in some cases. Where early symptoms only are in evidence, it is often possible to administer a purgative and also soft foods such as gruels, bran mashes. Maintenance of quiet is important; plugging of the ears with cotton wool is very useful to deaden noise.

Prevention

(*a*) **Attention to Wounds.**—Deep-seated wounds are ideal for the multiplication of the tetanus organism. Hence it is important that all wounds should be thoroughly cleansed and disinfected. Inoculation of tetanus spores into wounds occurring in operations as in castration, docking, &c., can be avoided by ensuring that instruments are sterilized before use and the operation performed under conditions of strict cleanliness. Where possible instruments should be sterilized in boiling water for fifteen minutes; failing this, instruments

should be first washed and then immersed in a strong solution of lysol (10 per cent.) for 30 minutes.

Marking of lambs should be done in the open in temporary yards and the lambs then placed in clean paddocks. Shearing cuts should be dressed with a suitable antiseptic lotion.

(*b*) **Stable Management.**—Regular cleansing of stables, proper disposal of manure from horse yards and attention to likely sources of injury in the form of projecting nails, &c., are useful precautionary measures. Special care should be taken with the hooves of horses to prevent cracking, by use of knife and rasp. Seedy toes, and thrush should be treated by scraping to expose normal horn.

(*c*) **Shed Hygiene.**—Shearing sheds should be cleansed by sweeping with a hard broom using caustic soda and hot water, and spraying the walls with a spray pump. Removal of accumulations of dead wool and faeces from sheep yards, branding race, counting out pens, together with possible watering of the yards will help to considerably reduce contamination with tetanus spores.

(*d*) **Use of Tetanus Antitoxin.**—Tetanus antitoxin is a serum prepared by immunizing horses against the toxin of the tetanus bacillus. Under normal circumstances, when animals become infected with tetanus spores, the response of the body is not sufficient to produce sufficient antitoxin to neutralize the toxin being formed at the wound site.

An injection of tetanus antitoxin almost immediately makes available to the animal a means of neutralizing the toxin being formed.

Dangers of post-operative tetanus may be avoided by the injection of antitoxin just before the operation. The amount for horses is one dose containing 500 units (U.S.A.) while for sheep is one dose containing 100 units (U.S.A.).

The immunity from such a single injection lasts from two to three weeks, which is usually adequate to protect the subject concerned. In other words this immunity will usually cover the period over which either sheep or horses are likely to develop tetanus. In areas where in previous years all hygienic precautions have been taken and losses from tetanus are still very heavy following either shearing or lamb marking, inoculation of the flock may be carried out at the same time as shearing or lamb marking.

(*e*) **Use of Tetanus Toxoid (alum precipitated).**—By the use of tetanus toxoid it is possible to immunize both sheep and horses against tetanus. Dose rate for horses is 10 ml. (c.c.); for sheep 1 ml. (c.c.). Immunity is not developed until approximately fourteen days after injection so that it is not suitable for use where an operation is to be immediately performed or where an injury has already been sustained, On the other hand it has the advantage that where this delay period of fourteen days can be allowed to elapse following injection, before the operation is performed, a more lasting immunity is given than is possible with tetanus antitoxin. A second injection of toxoid at the end of twelve months will give a permanent immunity.

(*f*) **Use of Tetanus Antitoxin and Tetanus Toxoid Simultaneously.**—Laboratory work has indicated that, where it is desired not only to immediately protect an animal against tetanus, but also to confer a relatively lasting immunity at the one handling, simultaneous use of antitoxin and toxoid can be made. The antitoxin is injected at one site and the toxoid at another (for example left and right thighs respectively). What occurs under these circumstances is that the antitoxin confers an immediate immunity while at the end of fourteen days the toxoid has had time to produce a more permanent immunity. Further field trials are required before recommendations can be given on this procedure.

Summary

(i) Advanced cases of tetanus give very little hope of recovery.

(ii) Early cases of tetanus often respond to adequate nursing measures and the use of tetanus antitoxin.

(iii) Preventive measures are particularly important in areas where losses from tetanus occur frequently, and are based on proper shed and stable hygiene, attention to wounds and the use either of tetanus antitoxin or tetanus toxoid.

Help your Neighbour and Be Helped by your Neighbour

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Swine Fever

OUTBREAKS of swine fever have occurred recently in Western Australia and New South Wales, and already in both States large numbers of pigs have died or have been slaughtered. An outbreak of this disease at any time is serious, but at the present time, when every endeavour is being made to increase pig production within the Commonwealth, the appearance of swine fever is calamitous.

The last outbreak occurred in the Commonwealth in 1927–28, when the disease was responsible for very considerable losses in New South Wales and Victoria. Since that date this country has been completely free of this most devastating of pig diseases.

The exact origin of the present outbreaks is not known, although most certainly the disease has been introduced, in spite of the Quarantine Regulations, by infected pig products from some overseas country where the disease exists.

Swine fever is one of the most serious of animal plagues, and has been responsible for enormous economic losses, both in Australia and other countries. In spite of the strict quarantine restrictions which have been placed on the interstate movement of pigs and pig products, there is a real danger of the disease spreading to Victoria, and therefore Victorian pig owners should be extremely vigilant and immediately report any sickness or mortality which occurs in their pigs. This is essential, as the extremely contagious nature of the disease makes it imperative that immediate action be taken to check its spread.

Swine fever is a highly infectious and contagious disease and affects pigs of all ages and breeds. The mortality rate is usually extremely high, and an entire herd may become affected and completely wiped out within a short period.

The first symptoms noted are loss of appetite. The affected pigs separate from other pigs and stand in one place in a dejected attitude with the back arched and head drooped. They show signs of leg weakness with swaying of the hind quarters; the eyes become blocked with a sticky discharge and there may be vomiting and diarrhoea, in which case the faeces are usually stained with blood. Signs of pulmonary distress also may be present. Rapid wasting occurs and the pigs die in from three to eight days. The disease spreads rapidly from pen to pen.

Post mortem lesions, which are often not clearly defined, may be confined to haemorrhagic reddening of the mucous membranes, and to small haemorrhages of the serous membrane of the kidneys, and congestion of the lymph glands.

The intestines sometimes show small haemorrhages on the outer surface and also on the inner lining, and in chronic cases the lining of the large intestine often becomes ulcerated.

The disease may be spread in several ways, but the introduction of infected pigs is the most common method of spread. In this connexion it is important to remember that pigs may be incubating the disease without exhibiting any symptoms, and therefore, at a time like the present, all newly purchased pigs should be isolated for at least two weeks before being added to the herd.

Pig owners would be well advised to refrain from trading in store pigs, at least, for the present.

In view of the possibility of the disease being introduced into Victoria by feeding pigs on uncooked food refuse, the Governor in Council has approved of the following regulations under the Stock Diseases Act :—

(1) No person shall use for feeding to stock any food refuse which has been removed from any place whatsoever unless such food refuse has been treated by boiling.

(2) The owner of any stock to which any food refuse is to be fed shall retain the refuse in containers in a place to which stock have not access until such food refuse has been treated by boiling, shall thoroughly cleanse all containers and vehicles used for collecting or retaining the refuse, and shall dispose by burning or burial all residue remaining after such cleansing treatment.

The virus of Swine Fever will survive for months in hams, bacon or any pork products, and these regulations provide that pig keepers who feed waste food from camps, hotels, or any other place, must boil the food refuse before it is fed to pigs.

It is important to note that the introduction of the disease into Western Australia and New South Wales is believed to have been due to pigs being fed on uncooked food refuse which contained pieces of infected pork or bacon.

Swine fever may also be spread from one property to another by persons carrying the virus on their clothes or boots and, therefore, pig owners should avoid going on to other properties where pigs are kept, and should not allow strangers to enter their piggeries.

The pig owner should immediately report cases of sickness among his pigs to the nearest Stock Inspector, or to the Chief Veterinary Inspector, Department of Agriculture, Melbourne.

[R. J. DE C. TALBOT, B.V.Sc.,
Chief Veterinary Inspector.]

Breed Your Own Pigs

Most pig raisers breed their own pigs and sell them as porkers or baconers, but some prefer to buy store pigs to fatten. The main reason put forward by farmers for adopting the latter practice is that they are unable to breed sufficient pigs to consume their food supply when it is at its peak, but they must concede that someone breeds the pigs which they purchase.

It is interesting to note that among those piggeries where butter-milk from butter factories is the major part of the food supply, and the seasonal fluctuation in butter-milk supply is very marked, the most successful owners breed all their own pigs. To do that it is necessary, when the milk supply is low, to use supplementary foods, and either to sell pigs at light weights or hold them in store condition for fattening when the food supply is high, and selling later at much heavier weights.

The pig raisers who breed their own pigs, and do not buy stores, eliminate one of the gambles from their pig raising enterprise by making themselves independent of the notoriously unstable store pig markets.

It is not always possible even at high prices for buyers to secure store pigs of the type they require, and when off-type stores are purchased the buyers are faced with the prospect of selling them at a discount when they reach porker or baconer weights.

The risk of introducing disease to their piggeries should deter farmers from the practice of purchasing store pigs at any time, but with the risk of an outbreak of swine fever, the most dreaded of pig diseases, now much greater owing to its presence in Western Australia and New South Wales, every pig raiser should seriously consider the wisdom of breeding his own pigs.

[L. A. DOWNEY, H.D.A., Pig Expert.]

Advantages of Dehorning Dairy Cattle

The autumn is a good time to dehorn the milking herd as most of the cows will be well advanced in their lactations and not too heavy in calf.

The advantages of dehorning are :—Reduced danger to human beings, especially from bulls. No torn udders or ripped cows. Quieter cows with reduced nervousness. Easier handling. Elimination of bossy cows. Smaller yards may be used. More cows may be fed at one trough. A more thrifty herd because the cows are more

contented and do not interfere with one another. No ripping and less bruising when trucked to new owners, markets or slaughter houses.

At one time cows were judged largely by the beauty of their horns, but to-day horns are receiving very little attention, and most commercial men prefer a dehorned animal. Dairy cattle breeders have not bred polled strains, as has been done with beef cattle and the only polled breed of cattle available for dairy farmers is the dual-purpose Red Poll breed.

Calves should be dehorned when under one week old by using caustic potash to destroy the horn buds. Full details of dehorning may be obtained by applying to the Director of Agriculture, Melbourne, C.2., for the free pamphlet "Dehorning of Cattle".

Beef Cattle

Although beef cattle are more contented and less spiteful to one another than dairy cattle, dehorning is just as advantageous as amongst dairy cattle.

Beef cattle men are using greater proportions of naturally polled bulls each year to breed polled cattle and eliminate the necessity of preventing the horns from growing or removing them later.

The cost of dehorning beef cattle is small compared with the losses through bruising by horned animals. In Victoria where holdings are small and where stock are handled regularly, the dehorning of beef cattle is more practical and more desirable.

Wool Branding of Sheep

The Misuse of Tar.

Complaints about the branding of sheep with tar, pitch, paint and other unsuitable branding fluids are frequently received from the manufacturers, both here and overseas, and recent complaints have again been received and endorsed by the British Wool Control.

The farmer brands his sheep so that he may identify them, and requires a branding fluid that will remain legible for twelve months. The woollens manufacturer requires a wool that will scour thoroughly. Up to the present time it has not been possible to find a branding fluid that will remain legible on the sheep for twelve months and then scour out.

At present, the best branding fluids to use are ones that dry quickly and form a hard insoluble mark which will not melt. The colouring matter in these fluids is various pigments which are insoluble, and not dyes. Such brands are unaffected by the hot scouring solutions, and will not run either on the wool of the sheep or later in the scour. As far as is known, most proprietary branding fluids are of this nature and will not scour out. The woollen manufacturers either cut these brands out completely before scouring wool for light-coloured materials, or, when scouring wool for coloured woollen goods, depend on the carding for the removal of the brand. The carding machine does remove the bulk of the hard brand under most conditions.

The larger firms manufacturing sheep-branding fluids believe that it is better to market an unscourable brand, most of which is removed during carding and combing, than to market a brand which is not 100 per cent. scourable.

Tar, pitch and branding fluids containing these materials are very unsatisfactory as neither tar nor pitch dries thoroughly. Both are apt to run in the scour and stain the whole of the wool.

A few sheep owners still use tar, others mix their own brands from tar, non-drying oils, &c., and a lesser number use pitch. It is these farmers who cause most of the trouble arising from the scouring of branded wool. Branding fluids are cheap, costing about 8s. per gallon, and one gallon will brand about 500 sheep, so that there is little or no saving in expense by using tar or other damaging materials. Branding fluids made from non-drying oils run in the scour and the pigments often give the wool a distinct hue. For instance, if such a fluid is red, a distinct pink hue may be imparted to the wool.

If every grower were to use a branding fluid that is unaffected in the scour, fewer complaints would be received.

The woollens manufacturing firms buy wools freely irrespective of the brands, but they are not prepared to vary the price paid for wools branded with different branding fluids.

Tar Objectionable on Wounds.

Objectionable as tar is, it is widely used on cuts, wounds and sores, and so contaminates the adjoining wool and becomes just as serious as a tar brand in the scouring of the wool later. Stockholm tar has the same effects on the wool as common coal tar. There are numerous disinfectants, such as "Dettol", and dressings, such as sheep blowfly-strike dressings, which are more healing and effective in treating wounds than tar.

Poultry

If the pullets have received proper attention from the time of hatching they should now be well grown, and as they approach the stage of egg production it is equally important that the same general care be continued in order to maintain them in the best condition and to prepare them for high egg production over a long period.

Any carelessness in regard to feeding, suitable environment, and general management would undoubtedly lead to poor production and financial loss.

It is always advisable to grade the pullets into groups of a uniform size. as under these conditions they are more contented, and this results in better development.

If good health of the birds is to be maintained, a continuous supply of tender green food should be fed every day, and, also, steps should be taken to plant sufficient of the different varieties for use throughout the year.

During February and March cull and market all birds likely to be unprofitable. This will allow more room for the remainder. Cockerels should be examined for faults, such as weak combs, crooked breasts, and underweight, and only the best kept for breeding purposes.

[H. F. Clinton, Poultry Expert.]

Bees

Most of the summer nectar-yielding eucalypts have now finished blooming, and bee-keepers are on the alert for forest sites showing promise of an autumn flow. Manna gum, now in bloom, will be welcomed by those whose apiaries have been confined during the past few months to yellowbox areas. Yellowbox does not yield sufficient pollen for the requirements of the bees, and while working on this bloom, and unless other sources of pollen are available, breeding is necessarily restricted, with the result that the working forces of the hive cannot be kept up to normal strength.

As a rule the secretion of nectar from bloom of the manna gum is light, but a liberal supply of pollen can usually be depended on.

Grey box has proved rather disapponting in most districts. During November a heavy new growth in the tree tops gave promise of a record crop of bloom but the anticipated budding failed to materialize and a light to medium yield is all that can now be expected.

Preparations for the rearing of autumn queens should be completed by the end of this month. Hives provided with a young autumn-reared Italian queen make the problem of swarm control much lighter during the following spring, as such queens rarely attempt to swarm unless breeding room is restricted.

[J. W. Thomlinson, Apiary Inspector.]

Crating Poultry for Market

Farmers who intend sending poultry to the market should be careful not to put too many birds in the crates, as overcrowding, apart from the humane point of view, causes severe losses in stock and robs the consignment of all profit.

Closely-packed birds are inclined to sweat, and this interferes with the quality of the flesh, causing discolouration. The plumage is apt to get dirty, and their drab appearance spoils the sale of the birds. It is possible to eliminate all these faults by simply allowing sufficient space in the crates during transit to market.

Buyers are always attracted by clean fresh looking stock, and this can be achieved by a little extra care when despatching birds to market.

Turkeys and geese must be placed in turkey crates only, as these allow sufficient height for the birds to stand up in comfort. On no account should turkeys or geese be despatched in fowl crates.

The floors of the crates should be covered with 4 to 6 inches of clean straw, as this adds to the comfort of the birds, keeps them clean, and allows them to be marketed in the best possible condition and appearance.

Not more than eight gobblers should be put in one crate; if they are extra good, seven is enough. Approximately ten pairs of light breed fowls or eight pairs of heavy breeds can be placed with safety in the standard fowl crate.

Fertilizer Rationing Notes

Dried Vine and Citrus Fruits

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

The general plan governing the distribution of superphosphate rations was published in the January issue of the *Journal*, and copies may be obtained on application to the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne, C.1.

All fertilizers are in short supply, and the limited quantities available are being distributed as equitably as possible, priority being given to the crops considered most necessary for the war effort.

In order that fertilizer rations may be systematically distributed to growers of dried vine and citrus fruits, producers have been registered with their usual supplier of fertilizers, and the ration must be obtained through that supplier, and none other. The registered list of each supplier shows the acreage of each class of fruit for each producer registered with him.

Citrus Fruits

Growers of citrus fruits have already received a ration of nitrogenous fertilizer for 1942 and it is not likely that further supplies can be made available for some months. Growers should take steps to plant green manure crops to be ploughed in and so build up and maintain the fertility of the soil.

Dried Vine Fruits

During the past year, fertilizers available for the vines have been greatly restricted. Since June last, sulphate of ammonia has been reserved for vegetables, potatoes and citrus fruits. Supplies of animal fertilizer also have been required for vegetable growing, but some nitrate of soda was released for general fruit growing.

It is proposed to make a small ration of blood and bone fertilizer available to growers of dried vine fruits for application in the early winter. The probable quantity is the equivalent of one-half hundredweight per acre of the vineyard and no doubt will be used to stimulate the growth of the weaker vines.

Green Manure Crops

Growers of vines, citrus and other fruit trees are advised to sow green manure crops of tick beans or peas wherever practicable. These should be planted early in the autumn to encourage maximum growth and make the most use of the soil moisture and irrigation water provided.

Superphosphate Available

The fertilizer distributors have been authorized to sell to growers superphosphate at the rate of 1 cwt. per acre of the total registered area of their vines and citrus trees, but such superphosphate must be used only for the sowing of green manure crops and is not transferable from one grower or block to another. Other orchardists who have no superphosphate available to them may obtain a special ration for use on green manure crops.

Special rations required for vegetable growing may be obtained on application to the Fertilizer Section of the Department of Agriculture, 81 Collins-street, Melbourne, or through the local orchard supervisor.

Journal of Agriculture, Index for 1942

Owing to the need for conserving paper supplies, due to the war, the Index of the *Journal of Agriculture* for 1942 will not be posted with each copy of the February issue of the Journal, as was done in former years. Copies of the Index, however, may be obtained, post free, on application to the Stores Branch, Department of Agriculture, Melbourne, C.2.

"Tatura Dwarf Globe" Tomato

Select and Save your own Seed

By F. A. MAHER, B.Agr.Sc., Assistant Horticultural Research Officer

THE tomato variety "Tatura Dwarf Globe" released by the Department of Agriculture during 1941 has continued to give very promising results this season and at the present time appears likely to replace the standard canning varieties in use in Victoria and particularly those varieties grown in the Goulburn Valley district.

Reports to hand on this season's crop of "Tatura Dwarf Globe" (which approximates 300 acres in the Shepparton area) indicate that the variety has retained its uniformity of type and that its cropping capacity under sound cultural conditions is in the 900–1,000 cases per acre range. Apart from these important features, its fruit size and canning quality have met with the approval of vegetable canning experts.

A plant of "Tatura Dwarf Globe", showing prolific cropping habit.

However, the desirable features of the "Tatura Dwarf Globe" variety will not be retained by indiscriminate saving of seed and growers who find that it suits their conditions would be well advised to save their own seed from selected plants, as there is no guarantee that seed of outstanding quality will be available in commercial quantities for next season's sowings.

In selecting fruits for seed purposes *make the plant the unit of selection*—don't make the common mistake of saving seed from attractive fruits selected from the packing bench, or sorting belt, as it is impossible to maintain the standard of a variety by this means.

Inspect as large an area of plants as possible, for, the greater the number of plants inspected the greater will be the opportunity of selecting plants which approach the ideal. Go through the crop systematically and select the plants which combine as many as possible of the following characteristics.

Suitable Habit of Growth, i.e., erect dwarf or semi-dwarf plants with good leaf coverage for the fruits, as opposed to plants of open sprawling habit which provide insufficient covering against the sun and allow the fruits to come in contact with the soil.

Smooth Round Fruit.—The ideal shape for the variety is shown in Fig. 1. It is not always possible to attain this standard throughout a plant, but the selected plants should carry fruits as near as possible to this type.

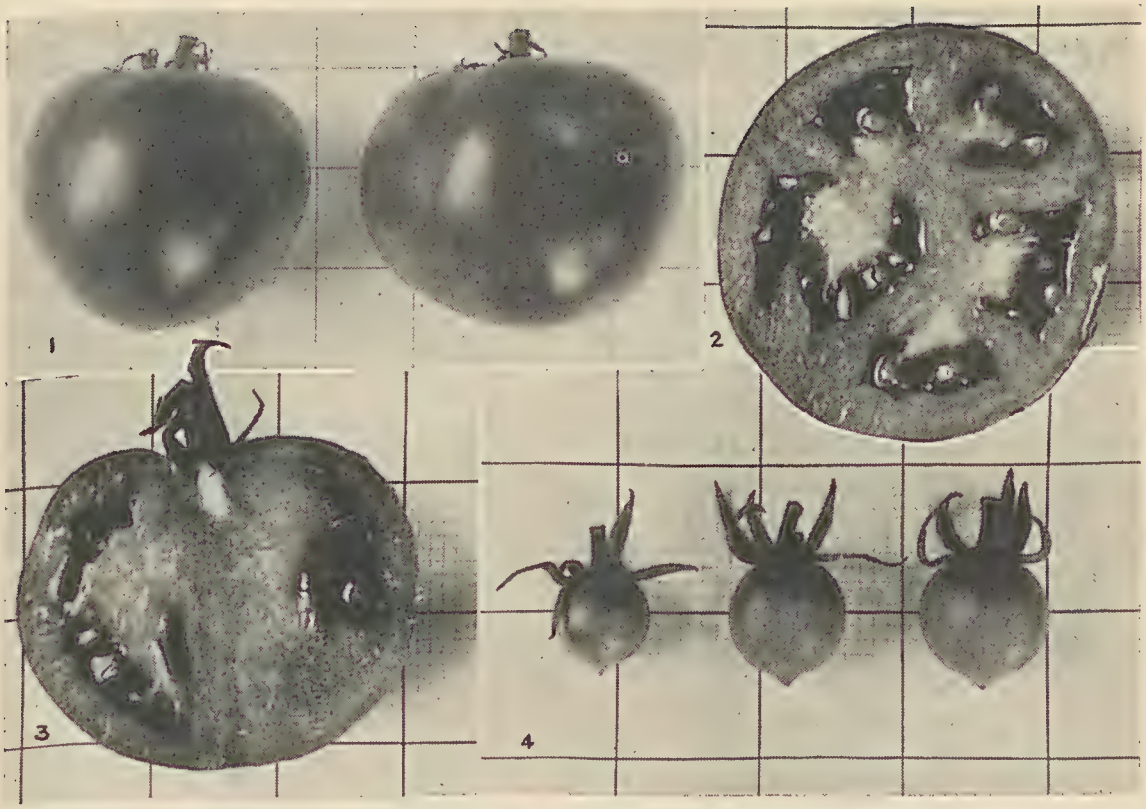
Suitable Size of Fruit.—Select for largeness of fruit with a preference for a plant showing uniformity of size throughout its crop rather than a plant showing a few excessively large fruits with the remainder well below average. As a guide to size, all fruits in the first three trusses of fruit should be between $2\frac{3}{4}$ and 3 inches in diameter.

Blossom End Scar.—This should be no larger than a pin's head and in the early stages of development the fruit should show a distinct nipple at the blossom end. Eliminate all plants showing a prominent blossom end scar.

Interior Quality of Fruit.—Fruits should not show any signs of puffiness—the outer and inner walls should be very thick (see Fig. 2) and the core should be small (see Fig. 3). These characters may be determined by cutting and examining representative fruits from plants selected tentatively on vegetative and external fruit characteristics.

Fruit Colour.—The colour of fruit to aim at is a deep tomato red, as opposed to the light red and pinkish colours which often detract from the market and canning value of a variety.

Earliness of Maturity.—This most important factor in the production of tomatoes for market



1. Typical fruits in lateral view. 2. Transverse section of fruit showing interior structure. 3. Fruit in longitudinal section—note smallness of core. 4. Young fruits—note globular shape and nipple at blossom end. (Scale of graphs—1 inch).

must be given due attention when making selections, and in selecting for this character an inspection of the crop should be made immediately after the setting of the first flower clusters.

All selected plants should be marked clearly so that pickers will leave them untouched during the harvesting of the crop. This can be most easily achieved by driving one or two substantial stakes in alongside each selected plant, and in order that the plants be more clearly defined, portions of the immediately adjacent unselected plants should be removed.

It is as well to note that all fruits from a selected plant may be used for seed as no one fruit on the one plant is better than another for seed purposes.

Other characters such as freedom from fruit cracking and resistance to disease may be given attention in the course of selection, but these latter are more the concern of the experimentalist and the grower would be better employed in concentrating on the selection of plants for the characters previously described.

Saving the Seed.

Fruits for seed purposes should be allowed to mature to the full-ripe stage on the plant. The extraction of the seed is most easily achieved by natural fermentation of the fruit pulp and may be carried out as follows :—

Extract the pulp from the tomatoes by mashing up the whole fruit or by cutting the fruits open and scraping the pulp out. The pulp should be placed in a wooden barrel or earthenware container and fermented for three to three and a half days by which time the seed should be clear of its mucilaginous coating.

After the fermentation is completed, pour water into the container, stir thoroughly, and decant off the trash ; repeat several times until the seed alone remains. The seed should then be removed from the container and spread out in a thin layer on calico or canvas to dry. The seed should be lightly raked from time to time to prevent it from forming into lumps. When the seed is thoroughly dry, place it in a suitable container and store in a dry position away from vermin.

Seed Certification in Victoria

List of Growers and Registered Areas Approved for 1942-43 Season

SEED certification schemes are in operation in Victoria in respect of the following species and strains of pasture seeds :—

1. Victorian Perennial Rye Grass.
2. Victorian Phalaris Tuberosa.
3. Tallarook "Late Flowering" Subterranean Clover.
4. Bacchus Marsh "Early Flowering" Subterranean Clover.
5. Victorian Irrigation White Clover.

Areas and growers approved for the 1942–43 season are as follows :—

1. Victorian Perennial Rye Grass.

R.G.— 1. Pickford, A., Clunes.
2. Pickford, H., Clunes.
5. Bridgewater, E., Learmonth.
6. Toose, H. A., Smeaton.
9. Troup, G. C., Tourello.
10. Sewell, C. W., Kooroocheang.
15. Wickham, T. B., Clunes.
16. Robinson, H. J., Clunes.
18. Branigan, J. S., Clunes.
19. Pickford, C. A., Clunes.
20. Pickford, J., Clunes.
22. Williams, A., Smeaton.
24. Evans, J., Smeaton.
28. McKinnon, A., Smeaton.
31. Sewell, A. J. and D. H., Smeaton.
33. Toose, G. C., and A. W., Smeaton.
35. May, W. H., Smeaton.
39. Ward, O. J., Kingston.
41. Muller, C. T., Ullina.
43. Carter, J. R., Clunes.
44. Drife, G. R. H., Clunes.
46. Cosgrove, A., Smeaton.
47. Bunn, J., Allendale.
50. Cook, W., Clunes.
52. Drife, T. W., Coghill's Creek.
53. Griffin, J. M., Coghill's Creek.
55. Muller, M., Smeaton.
57. Kinnersly, F., Glendaruel.
59. Armstrong, J. R., Allendale.
62. Spittle, S. G., Ascot.
69. McLennan, A. C., Clunes.
72. Ford, E. H., Clunes.
74. Redman, F. W. and A. J., Smeaton.
76. Donovan, P., Learmonth.
78. Baird, D., Blowhard.
80. Grills, J. C., Blowhard.
86. McColl, A., Miner's Rest.
88. Wrathall, D. W., Clunes.
89. Trewin Bros., Coghill's Creek.
93. Luhrs, C. R., Wendouree.
98. White, W. W., Alfredton.

R.G.— 99. White, R. T., Cardigan.
100. Walton, W. A., Burrumbeet.
102. Higgins, F. W., Irrewarra.
104. Currington, A. H., Warncoort.
106. Saddlier, E., Warncoort.
107. England, S. C., Warncoort.
108. England, W. G., Warncoort.
109. Hawtin, A. W., Colac West.
112. Hawtin, F., Colac West.
116. Kenny, M., Cororooke.
118. Martin, H. L., Irrewarra.
119. Menzel, C., Armytage.
120. Menzel, R. K., Armytage.
121. Morrell, J. B., Beeac.
122. McDonald, A., Beeac.
123. McMillan, T. S., Cororooke.
125. Roache, J., Nalangil.
126. Roache, P., Nalangil.
128. Ryan, D. M., Nalangil.
133. Rankin, A., Colac.
134. Baulch, G. R., Colac West.
136. Baggott, M., Cororooke.
137. Drewry, C. G., Ondit.
140. Dignan Bros., Warncoort.
141. Hughes, A. E., Larpent.
142. McDonald, J. J. and Sons, Birregurra.
147. Mackay, D. G., Irrewarra.
148. Middleton, A. H., Nalangil.
150. Speirs, A. E., Nalangil.
158. Spalding, J. A., Larpent.
160. Billings, F., Colac.
163. Inglis, G., Larpent.
166. Inglis, A. D. C., Larpent.
167. Speirs, F. C., Nalangil.
169. Collins, G. J., Irrewarra.
172. Conheady, J., Nalangil.
173. Brien, A. J. and Sons, Birregurra.
178. Buckle, W., Larpent South.
181. Gubbins, N., Birregurra.
194. Swayn, H. J., Nalangil.
201. Bolton, M., Malmsbury.
202. Ward, A. S. and J., Kyneton.
203. Olive, E., Lauriston.
206. Hutcheson, S. G., Kyneton.
207. Sullivan, T. M., Malmsbury.
210. Donovan, J., Malmsbury.
213. Thomson, R. H., Kyneton.
214. Geddis, R., Kyneton.
217. Young, H. H., Malmsbury.
218. McPherson, A. L. and J. J., Kyneton.
224. Portwine, E. C., Lauriston.
225. Trewhella, C. and A. B., Newham.
226. Dettmann, W., Kyneton.
227. Rollinson Bros., Green Hill.
228. Douglas F., Redesdale Junction.
231. O'Donnell, J., Kyneton.
232. Thomas, L. R., Drummond.
233. Lyall, T., Redesdale Junction.
234. Henderson, L., Lauriston.
235. Girvan, J. H., Taradale.

R.G.—251. Buchholz, L. G., Lismore.
257. Mahony, J., Kolora.
258. Maloney, P. G., Kolora.
275. Purcell, M. and Sons, Bessiebelle.
278. Kennedy, M. Winlow.
288. Ross, W. R., Yering.
291. O'Leary, J., Dixie.
292. Streitberg and Sons, Darnum.
305. Swan, J. M., Burrumbeet.
307. Robinson, H. and E. J., Kooroocheang.
310. Risk, W., Ullina.
311. Ritchie, J. F., Tourello.
315. Kierce, J., Clunes.
317. Keith, H. C., Ullina.
319. Hepburn, D., Kooroocheang.
320. Mezzeni, W., Kooroocheang.
321. Gervasoni, N. A., Kooroocheang.
325. Andean Bros., Kangaroo Hills.
328. Wilson, G. T., Kooroocheang.
329. Thomas, S. R., Miner's Rest.
330. Gollop, R., Kingston.
331. MacRae, C., Tourello.
406. Roache, D., Nalangil.
407. Menzel, A. A., Winchelsea.
408. Walsh, J., Swan Marsh.
409. Baudinette, I. F., Larpent.
418. Williams, O. M., Colac.
419. Sutherland, J. W., Nalangil.
422. Craig, N. and I., Winchelsea.
423. Craig, N. and I., Winchelsea.
424. Nicholas, A. W., Birregurra.
426. Finlay, E., Coragulac.
429. Buchanan, C., Irrewarra.
431. Bourke, J. Cororooke.
433. Reeves, T. T., Mt. Gellibrand.
435. Mathews, B. J., Colac West.
436. Stewart, G. M., Birregurra.
438. Johnston, S. A., Birregurra.
439. Coad, E., Ondit.
442. Ray, G., Warrion.
444. Burns, A., Corunnun.
445. Lidgerwood, R. W., Birregurra.
446. Lyness, J., Colac West.

R.G.—450. Champness, P. L., Mt. Moriac.
451. Griffin T. and Son, Birregurra.
452. Croft, M. W., Irrewarra.
453. Dunse, W., Birregurra.
454. Bauer, C., Cororooke.
455. Brown, R. C., Warrion.
456. Fisher, L. T., Warrion.
457. Inglis, J. T., Larpent.
458. Finlay, A., Cororooke.
459. McKenzie, D. G., Larpent.
460. McRae, A., Nalangil.
461. Whytecross, A., Rickett's Marsh.
462. Kerr, R. L., Coragulac.

2. Victorian Phalaris Tuberosa.

P.T.— 6. Cameron, E. H., Buangor.
7. Tucker, L. E. and Sons, Vite Vite.
9. Buchholz, L. G., Lismore.
14. Wilson, G. T., Kooroocheang.
15. Beach, H. E., Birregurra.

3. Tallarook "Late Flowering" Subterranean Clover.

T.K.—1. Head, A. C., Tallarook.
5. Head, A. C. & Son, Shepparton.

4. Bacchus Marsh "Early Flowering" Subterranean Clover.

B.M.—1. Toose, G. C. and A. W., Smeaton.

5. Victorian Irrigation White Clover.

I.W.— 3. Jackman, J. W., Dingee.
5. Jackman, F. H., Dingee.
6. Moller, R., Ky Valley.
7. McEwen, J., Stanhope.
8. Purdy, J., Ky Valley.
9. Andrews, W., Ky Valley.
10. Rutherford, S., Ky Valley.
11. Hayres, H., Tongala East.
12. Coleman, G., Girgarre.

Help your Neighbour and don't be too proud to let him help you

Washing of Horses

Regular washing of horses' coats is to be condemned. It removes the natural grease from the coat and consequently some of Nature's means of protection from cold. Its practice in cold, changeable climates may easily lead to sickness.

The dangers are due not to the actual washing, but to neglect to thoroughly dry the animal and keep up the warmth of the skin.

Washing the horse's legs and belly on return from work to get rid of the mud is frequently followed by a skin eruption commonly known as "mud fever." This condition may be serious but, can be prevented by allowing the mud to dry and then brushing it off.

There are times when, for the sake of appearances, it may be necessary to wash white legs or other parts for the removal of dirt stains which will not brush out. When this is done, provided the parts are thoroughly dried, no harm will result.

Bran or sawdust well rubbed in, is of great assistance in drying.

IN THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

THE summer-flowering annuals and dahlias combine to give a mass of colour in the February garden. To maintain this brightness, it is necessary to pick the old flowers off the plants frequently and to provide plenty of moisture. Many of these summer-flowering annuals, like phlox, zinnias and marigolds, are surface rooting and hence frequent watering is necessary. If the plants are not too crowded, a light hoeing of the surface soil will assist in water penetration, and the beneficial effects of a mulch of old stable manure or compost, or even dried weeds or lawn clippings, will be quite noticeable. As well as supplying small amounts of plant food the mulch keeps the surface soil cool and moist and enables the period between waterings to be extended. This mulch rots down during the autumn and can be dug under in the winter.

Occasional waterings with very dilute liquid manure will assist growth and encourage flower production.

A constant watch must be maintained for Red Spider on the under surface of the leaves during hot, dry weather. Do not allow this pest to become too numerous before taking remedial measures. Control measures were mentioned in these notes last month.

Maidenhair Fern

Maidenhair ferns are usually at their best during summer and early autumn. They should be kept in the greenhouse or in a cool, well-lighted room. Hot, dry air, direct sunlight and dry soil conditions should be avoided. Old fronds which have withered should be cut off at the base. To remove dust from the foliage, spray with water or invert the pot and swill the fronds in a bucket of water. Soot water, or very weak liquid manure, can be given every two or three weeks. Ordinary waterings must be frequent and regular and the pots should be examined occasionally to ensure that the drainage is satisfactory.

Iceland Poppy

The Iceland Poppy is popular because of its free-flowering habit during winter and spring and also because of its suitability as a cut flower. Many types are now grown and giant forms and pastel and bright pink shades are common. Two good pink strains are *Coonara Pinks* and *Porter's Westella Pink Improved*. In the Gartford strains are included *Giants*, *Art Shades*, *Daffodil Tones* and *Mixed Art Shades*. *Gartref* strains are not so bold as the *Gartford* types, while *Monstrosa* and *Improved Sunbeam* strains produce large flowers on long stems.

For winter flowers, seed of Iceland Poppy should be sown not later than the first two weeks in February. The seed bed should be prepared thoroughly beforehand by digging in a generous supply of well-decayed manure or compost. Then a light application of lime—about 3 oz. per square yard—should be forked into the surface soil. Smooth and level the seed bed with a rake. The seed is very fine and in order to obtain a light, uniform sowing, it is usually bulked with at least four times its own volume of fine sand or soil. After sowing, firm the seed bed with the back of the spade and sprinkle a light covering of sieved horse manure, which must be old, and light soil over it. On account of the fineness of the seed, the covering must be very light, just sufficient to cover the seed.

At this time of the year, the seed-bed will require shading. This can be provided by a few shoots cut from the asparagus bed, or some other light-foliaged plant, or by a hessian blind. Keep the surface soil moist by frequent sprinklings of water from a fine nozzle. Be careful not to wash the surface soil.

Rose Pruning

A light pruning of the rose bushes early this month will assist in the production of a good display of autumn blooms. Remove the seed pods (hips) by cutting to a suitably-placed bud below. As well as for flower production, the aim of this pruning should be to balance up the top of the plant in preparation for winter pruning. Small, spindly growths should be removed and where the bush is too dense, an occasional shoot can be cut out.

Suckers arising from the root-stock will also require to be removed, otherwise they starve the budded variety. The proper method for removing these growths is to uncover the base of the plant and cut off the shoot completely. Very frequently these suckers are pulled off and sometimes they

break below soil level. Later this broken-off piece below will give rise to numerous suckers. Cutting the suckers cleanly often prevents this re-growth.

IN THE VEGETABLE GARDEN

Celery

Celery is one of the most difficult vegetable crops to grow. It is a crop which requires rather more attention and thought than many of our other vegetables. A very fertile soil and good drainage are two very important factors. The soil should be of a rich, loamy character which will retain enough moisture to keep the plants growing steadily. The water-holding capacity of the soil, as well as its fertility, may be improved by deep trenching, at the same time incorporating large amounts of animal manure or compost. If 2 oz. to 3 oz. per square of market garden manure, i.e., a complete fertilizer containing nitrogen, phosphate and potash, is thoroughly mixed with the soil during this trenching operation, it will provide those elements essential for growth.

Celery seed is small and slow to germinate, and it is usually sown in drills in seed beds, or in seed boxes. It is important that fresh seed be sown. The seed may be sown from September to February and transplanting can be carried out from December to March. Cover the seed with not more than a quarter of an inch of sandy soil and keep moist until germination, which should occur in two or three weeks.

Frequently the tap-roots of the young seedlings in the seed-bed are cut when the latter are about 2 inches high. This is done by cutting with a sharp knife about 1 to 1½ inches below the soil level. The injury to the tap root causes the production of a mass of fine, fibrous, feeding roots. The plants should be well watered after the roots have been cut in order to settle the soil where it is disturbed.

In about twelve weeks, when the seedlings should be 4 inches to 5 inches high, they will be ready for transplanting.

The method used in planting out the seedlings will depend upon the type of blanching to be adopted. A number of gardeners still prefer the open trench system. A trench about 1 foot deep and the same width at the top, but with sloping sides, is made along the length of the bed and the small plants are spaced about 8 inches apart along the bottom of the trench. This method is very useful because the plants are easily irrigated. In making the trench, earth is piled up at the sides and as the plants grow, it is drawn back into the trench and so covers and blanches the stems. The celery should be fit to pick in twelve to fifteen weeks from transplanting. Two good varieties for the home garden are *Golden Plume* and *Golden Self Blanching.*

Onions

Seed of the white or silverskin type of onions may be sown this month in seed beds, to provide plants for planting out in April. Two varieties which give good results are *Silverskin* and *Early Barletta.*

Prepare the seed bed by digging in a generous amount of well-decayed manure and 3 oz. to 4 oz. of blood and bone per square uard. Break the soil down to a fine tilth and give the bed a thorough soaking with water to settle the soil before sowing. Sow the seed and firm it with the back of the spade before covering with about half an inch of fine sandy soil.

The first signs of germination will be a thin, looped leaf appearing above the surface. Later, the loop will disappear and the remains of the onion seed will appear again above the soil, perched on the top of the leaf. The young seedling onion continues to draw nourishment from the seed and at the same time produces the young root system underground.

A sowing of spring onions can be made also this month. This crop is usually sown in a well-prepared seed-bed and if the seedlings grow rapidly they will not have a harsh, rank flavour. The variety of onion most commonly used is *White Lisbon*, although some of the other white onions like *Silverskin, Early Barletta* and *Odourless* may be used. Surplus seedlings of other onion varieties in the seed-bed, provided they have been grown quickly, are often used for spring onions.

Red Beet

Seed of Red Beet should be sown in drills where the plants are to remain. Prepare the beds in the usual way for root crops and apply 6 to 8 oz. of lime per square yard. Sow the seed thinly in drills 18 to 20 inches apart and cover with about three-quarters of an inch of fine soil. Later, thin the plants to 3 inches apart and water regularly. This crop must be grown quickly to produce good quality beets. Weed and cultivate as required being careful not to damage the tender beets with the cultivating implements. *Crimson Globe* and *Detroit Dark Red* are recommended.

Spinach

The first sowing of *Prickly Seeded (Winter) Spinach* may be made late in February. Sow the seed thinly in drills about 1 inch deep and cover with half an inch of sieved soil and manure. A light covering of strawy manure will prevent washing of the surface soil and provide shade and prevent the surface drying. Space the drills about 12 to 15 inches apart. Spinach likes a fertile soil and the addition of blood manure at the rate of 3 or 4 oz. per square yard, when the bed is being prepared, will produce a good luxuriant foliage. Good drainage is another essential for spinach.

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Assistant Horticultural Research Officer

Summer Cultivation in the Orchard

DURING the summer months a large amount of time and labour is spent on cultivation practices. Usually this work is looked upon as necessary routine in an orchard and in some instances it is undertaken without considering what effect it produces and whether it is actually worth while. The main object in regularly cultivating the soil around the trees is to kill weeds and so prevent their competing with two of the trees' chief requirements, namely, water and nitrate nitrogen.

The amount of nitrate nitrogen in the soil increases rapidly during the spring and summer months, due to the activity of soil organisms which are favoured by the increased temperature. These nitrates are formed in the surface soil and loss may occur either by allowing surface-feeding weeds to grow, or by applying excessive irrigation water, in which case the nitrates are washed through the soil and out of the feeding zone of the roots of the trees. Under irrigated conditions, therefore, the chief reason in cultivating to control weeds is to conserve the nitrogen in the soil; the soil moisture aspect being relatively unimportant. Many orchardists in these northern areas allow weeds to grow without interference during the late summer months after the trees have obtained their nitrogen supplies, and plough this growth under before planting the green crop in the autumn.

Excessive cultivation of the soils in these areas, especially when they are slightly wet, is likely to cause a deterioration in soil structure. This means that the soils will become less workable and that the absorption of irrigation water will be less rapid.

Some established orchards in irrigation areas are not cultivated at all and have a permanent cover of grasses and clovers which is kept under control by cutting regularly with a mower. Under such a system, large additions of artificial fertilizers would be required in order that the trees would receive adequate nitrogen supplies, and of course, at the present time, this is not practicable. Advantages claimed for this system include maintenance of good soil structure, rapid penetration of irrigation water and a lowering of the soil temperature caused by the mulch of mown grass.

Under non-irrigated conditions the need for conservation of both moisture and nitrates is evident. However, to cultivate more frequently than is required to control surface weed growth is regarded as so much waste of time and labour. One frequently notices growers cultivating an already bare soil, and in some instances even using the plough in order to obtain what they term a soil mulch. This procedure does not reduce evaporation from the soil but, in fact, may possibly increase water loss by bringing moist soil to the surface, where it will quickly dry out. An excessively loose condition of the soil produced by over-cultivation is likely to be followed by severe washing should a heavy rainstorm occur during the summer.

Help your Neighbour - United We Stand - Divided We Fall

Drying and Processing Tree-Fruits

By W. R. JEWELL, M.Sc.,
Chairman, Fruit Processing Committee

THE Fruit Processing Committee* has carried out investigations into various aspects of the processing of dried tree-fruits over a number of years and, from time to time, has recommended processes, both for field and packing-shed procedure. These recommendations are now incorporated in this article. Amendments and revisions made since the recommendations were first issued are included.

APRICOTS, PEACHES, PEARS

Fruits sulphured in Australia comprise mainly apricots, peaches, pears and apples, with limited quantities of nectarines and figs (excepting Smyrna), and small packs of raisins and sultanas. For sale within Australia and the United Kingdom, there is a prescribed upper limit of 14 grains of sulphur dioxide per pound for apricots, peaches, pears, apples and nectarines, and 5¼ grains in the United Kingdom and 14 grains in Australia for sultanas and raisins.

Absorption and retention of sulphur dioxide varies with different fruits and with the variety and maturity of each fruit; therefore the processing procedure should be modified appropriately. The darkening of dried fruits during field processing, or subsequent to packing, is invariably associated with a low sulphur content and is accelerated by a high moisture content. The problem is particularly acute in "moist packed" fruits, which do not retain sulphur as well as the dry packs and consequently require a high initial sulphur dioxide content.

The first requirement for a high grade dried fruit is a uniform and high quality fresh fruit. To ensure this, fruit must be harvested at the correct stage of maturity, handled carefully to prevent damage, and rejected or segregated where faulty. Picking receptacles should be kept clean and may be lined with clean newspaper; with soft fruits, receptacles should be only partially filled to prevent bruising. Rejections are made most conveniently while the fruit is being pitted and should include pieces which are bruised, over ripe, under ripe, windfalls, or fruit damaged by hail, insect pests, &c. Apricots should be picked "eating-ripe." Peaches can be improved by picking when firm and well coloured and allowing them to stand in cases for further maturity. After one or two days the ripe fruit is picked out for pitting and the remainder is left for further maturity. Pears are picked at the hard stage and ripened in boxes covered to exclude light. When the bulk is mature and yellow it is ready for cutting and sulphuring, although it is usually necessary to keep a proportion for further ripening and to discard withered samples. With all fruits, the opportunity should be taken when pitting or cutting to reject or separate all fruits not

* The Fruit Processing Committee acts under the Council for Scientific and Industrial Research. Members are:—W. R. Jewell, Agricultural Research Chemist, Victoria (Chairman); A. V. Lyon, C.S.I.R., Research Station, Merbein; E. C. Orton, C.S.I.R., Research Station, Merbein; C. G. Savage, Chief, Division of Horticulture, N.S.W.; A. G. Strickland, Chief Horticultural Officer, S.A.; D. G. Quinn, Viticulturist, Victoria (Secretary).

reaching the required standard of quality and maturity. Different grades or varieties of fruit should not be mixed on any account. Examination of commercial samples shows that there is decided depreciation in value when growers fail to grade the fruit prior to processing.

Procedure for Sulphuring Apricots

It is necessary that the quality of dried apricots be kept consistently high, and that the various producers approach as closely as practicable to common standards in reference to the sulphur content of the dried product. Adoption of the following procedure will help in this direction.

(*a*) *Maturity.*—It is essential that all fruit be picked "eating-ripe," and the immature, over-ripe, or damaged fruit should be sorted and processed separately or discarded altogether. When pitting apricots, it is essential to make a further selection, discarding from the main pack all but uniform and sound fruit. This has not been a general practice in the past, and a depreciated, mixed pack has resulted.

All fruit in one sulphuring chamber must be of uniform maturity, to yield a uniformly sulphured product. It is recognized that firm fruit retains sulphur less readily than ripe and in general gives an unsatisfactory product, and that over-ripe apricots (slabs) are dark, misshapen and unattractive.

(*b*) *Type of Chamber.*—An air-tight chamber is recommended and the covering should be of some light material, e.g. "malthoid." In the case of movable hoods, precaution should be taken to prevent ingress of air at the base of the hood by using compacted moist earth around the bottom.

A number of small air-tight chambers is recommended in preference to one large one, so that fruit should not be held for any length of time after cutting and before sulphuring. For example, when using 6 ft. by 3 ft. trays, the size of the chamber should be sufficient to accommodate a stand of about fifteen trays, with a clearance of about 6 inches between the trays and the sides and top of the chamber. Trays should be "staggered" 6 inches when stacking.

Vent holes, 1 inch in diameter, should be provided in the roof of the chamber close to the wall farthest from the sulphur fire when one fire is used, or in the centre of the roof where a fire is used at each end of the chamber. Draught regulation is then obtained by plugging (using ordinary corks) or opening the holes as required. A moveable slide, preferably of glass, is a desirable adjunct in order to view the conditions inside the chamber and to test the condition of samples of the fruit.

(*c*) *Method of Sulphuring.*—The quantity of sulphur burned varies with the environment, including the type of chamber, its degree of tightness and the temperature. Up to 8 lb. of sulphur per ton of fresh fruit usually is ample, and lesser quantities prove sufficient under satisfactory conditions for burning and adequately controlled vents. A good quality sulphur, dry and reasonably free from impurities, gives best results. The amount of air within a closed compartment is not sufficient to obtain and maintain the desired sulphur dioxide concentration, as the fire goes out in a completely closed chamber; with ordinary chambers there is often sufficient leakage to give satisfactory results. Best results are ensured by having an arranged intake of air over the sulphur fire and controlled vents in the top of the chamber. The sulphur pit should be located just outside at one or both ends of the chamber, with a free entrance into the chamber and a small inlet vent to the sulphur pit.

The sulphur should burn readily during the time the fruit is in the chamber, and slight fumes should be apparent issuing from the vent hole. If these fumes should cease, inspect the sulphur pan, and relight any unburnt sulphur or add more sulphur if none remains. If the sulphur is all burnt before the expiration of the sulphuring period, it is an indication of excessive draught through the hood; reduce the draught by diminishing the size of the inlet and exit vents and examine the hood to ascertain if there is a general leakage. It is desirable so to regulate the draught that the requisite quantity of sulphur shall burn throughout the sulphuring period, and be practically burnt out at the expiration of that period.

The weight of fruit in a charge should be ascertained by weighing the quantity of pitted fruit on two or three trays; the average per tray and the total weight per charge can thus be obtained. Calculate the amount of sulphur necessary, weigh it, and measure the volume in a container. Thereafter, it would be sufficiently accurate to measure the same volume of sulphur each time a similar number of trays is sulphured.

The dense fume or running fume method consists of keeping the sulphur burning, with the vents open, during the full period. Adequate sulphuring under these conditions is obtained

in four to six hours. In the so-called "closed chamber," if there is sufficient leakage to maintain burning, similar results are obtained, though it may be necessary to extend the period of sulphuring up to eight or ten hours. The practice of leaving the fruit in the chamber over night is not recommended. The longer sulphuring periods apply to fruit to be moist-packed. High percentages of sulphur dioxide in the fruit are obtained either by dense fumes for the required period, or by prolonging the period of sulphuring.

(*d*) *Handling the Fruit.*—It is desirable to sulphur as quickly as possible after cutting, preferably within two hours. (Hence the desirability, under (*b*), of a number of small chambers.) The trays should be kept clean, to prevent discolouration of the fruit, which should be stacked from the bottom upwards in the order in which it is cut. Freshly cut fruit absorbs sulphur dioxide more readily than fruit cut some time prior to sulphuring, and this arrangement of stacking allows the driest fruit to be in contact with the maximum density of warm sulphur fumes, thus tending to uniform sulphuring results.

On completion of sulphuring, the fruit should be exposed to the sun as quickly as possible, as rapid preliminary drying is essential to avoid excessive loss of sulphur dioxide. Inferior fruit discarded from the main pack should be sulphured heavily.

(*e*) *Characteristics of Sulphured Fruit.*—The filling of the cups with juice is not necessarily a reliable indication of satisfactory sulphuring, as fruit in this condition frequently is over-sulphured.

Correctly sulphured fruit is usually characterized by a firm core, an easily detachable skin, with some exudation of juice into the cup, and a general evenness of colour of the cut surface. The fruit usually is over-sulphured if the whole of the flesh has become softened, and if the cups have over-flowed with juice.

(*f*) *Resulphuring after Wet and Humid Weather.*—Changes in weather sometimes make it necessary to hold the fruit in stacks after sulphuring to prevent wetting by rain, and also may result in a slow initial drying rate. These conditions result in an unduly large loss of sulphur dioxide, and frequently the percentage retained is insufficient to maintain quality. Resulphuring as the weather clears is necessary in such cases—otherwise the percentages of dark fruit, and of fruit insufficiently sulphured for the moist pack, are excessive.

Peaches, Nectarines and Pears

The general procedure for sulphuring peaches, nectarines and pears is similar to that for apricots, except that these fruits absorb sulphur dioxide more slowly than apricots, and do not retain it so well. Cases of over-sulphured peaches and nectarines are seldom

Halved and pitted fruit ready for sulphuring.

noted at the packed stage. They require a longer period in the sulphur chamber, and moist packing is not desirable. Pears absorb fumes slowly and cases of over-sulphuring are extremely rare. Double sulphuring, to extend the period in the chamber up to 30 hours, is frequently practised. Sulphuring should be continued until the pears are so soft that they cannot be lifted from the trays. Delivery with insufficient sulphur is the most common cause of deterioration in pears.

As with other fruits, rapid preliminary sun-drying is essential to avoid excessive loss of sulphur dioxide. However, to prevent discolouration, it is necessary to "stack" the trays after about two days of exposure to the sun, and to complete the drying in these shaded conditions.

The Moist Pack for Apricots

Whereas a few years ago apricots were packed in a sun-dried condition, it is now common custom to market a "moist pack," which is preferred on the overseas market and also has become established at home. The production of a satisfactory moist pack apricot involves certain processing problems which have not yet been solved by all packing sheds, as experience has shown that some packers have not been entirely successful in producing a satisfactory product which will retain its colour on storage. Attention therefore is drawn to the following points which have an important bearing on the question and which must be observed to obtain the best results in moist packing.

(*a*) *Grading.*—Further hand grading in the packing shed invariably is required if an attractive and uniform product is to be obtained. Reports from overseas markets stress the necessity for more consistent grading both for colour and size. In addition to size-grading, picking out of faulty pieces by hand seems essential.

(*b*) *Moistening.*—Moistening is accomplished by immersion in hot or cold dips, or by steaming. The hot dip may consist of water or a solution of sodium or potassium metabisulphite, of common salt or of glycerine. For the usual size of dip tank (60 gallons), 1½ gallons of glycerine or 2 lb. of salt, or up to 5 lb. of metabisulphite have been variously used for a period of immersion of from 10 to 20 seconds. The requisite time of immersion or steaming depends on the condition of the apricot and can be determined only by trial. Glycerine is not now recommended, as the benefits are slight and at present it is costly and difficult to obtain. Hot salt solutions are favoured in preference to hot water, although the benefits if any are so slight that they are difficult to discern. The metabisulphite dip is established in common use; it has a greater value in retaining sulphur dioxide than either salt or glycerine and apparently an equal value in other respects. Cold dips, either metabisulphite or sulphurous acid solution (1 to 2 per cent. obtained by passing sulphur dioxide through water) have been successful, with periods of immersion of two to three minutes. Steaming for approximately twenty minutes is also practised by some packers.

After dipping, sulphuring for two to four hours is recommended irrespective of the type of dip; resulphuring has been successfully omitted, in some instances, for parcels with a very high initial sulphur content. For thick heavy fruit, the higher range of both immersions in the dip and sulphuring are favoured.

On removal from the sulphuring chamber it is best to stir the fruit slightly to prevent settling on the trays.

(*c*) *Moisture Limits.*—There is a limit to which the moisture content can be raised consistent with successful keeping qualities during export or storage. This limit is 20 per cent. moisture in apricots packed in sealed tin-lined containers or in paper-lined boxes for export, and 25 per cent. in apricots in paper-lined boxes for immediate consumption. The determination of the moisture content of processed fruit therefore should be a regular procedure in a packing shed; it is difficult to see how otherwise the moistening process can be adequately controlled or a uniform product turned out from day to day. Methods of determining moisture are discussed later.

(*d*) *The Sulphur Content.*—Undoubtedly the sulphur content is the outstanding factor concerned with the retention of a bright colour in moist pack apricots, which lose sulphur dioxide more quickly than do dry-packed fruit. A number of instances of darkened apricots have been examined and invariably the sulphur dioxide was only 1 grain per pound or less. There was in fact, a correlation between degree of darkening and sulphur content. It is essential that moist-packed apricots, immediately after processing, should contain *right up to the limit* of 14 grains sulphur dioxide per pound.

In order to ensure that such is the case, two courses are open: either over-sulphured dry apricots should be selected, or resulphuring after processing must be employed. In view

of the widespread adoption of moist packing, it is obvious that the latter procedure must generally be followed. The use of a sulphurous acid moistening dip has obviated the necessity for resulphuring in some cases of apricots with a high initial sulphur content, but prolonged dipping is necessary to obtain a material increase in the sulphur content of the fruit. This prolonged dipping raises the moisture unduly, necessitating further drying.

It is obvious that a knowledge of the sulphur content both before and after processing is an absolute essential if a uniform and satisfactory product is to be maintained. Without such a knowledge, moist packing must be haphazard and accompanied by frequent instances of deterioration and wastage. A "workshop" method for the determination of sulphur dioxide content is described later and this, or other suitable method, should be used to determine the sulphur content before and after moist processing.

(*e*) *Storage.*—Moist pack apricots in boxes tend to deteriorate relatively quickly and therefore arrangements should be made for their prompt sale on arrival at destination. Unnecessary storage should be avoided, and in spite of alleged difficulties, it is advisable to "moist pack" progressively throughout the year as demand requires, preferably immediately prior to sale. If all apricots are moist packed at the end of the drying season, wastage must be expected with those subjected to prolonged storage.

Evidence is available that climatic conditions during storage play an important part. Apricots containing 18 per cent. moisture and 12 grains sulphur dioxide per lb. retained their colour and generally attractive appearance when stored for about four months in Melbourne; but a portion of the same box darkened to an unmarketable degree when stored for the same period in northern Queensland. It would appear that no attempt should be made to store moist pack apricots under hot humid conditions (except perhaps in tins) and that dry pack apricots are preferable and should be advocated. Storage under dry, well-sheltered conditions gives the best results.

(*f*) *Reconditioning Darkened Apricots.*—Parcels of apricots and peaches which have become dark and unattractive subsequent to packing come under notice each year. Such deterioration generally occurs in moist packed fruit, although darkening is noted occasionally in dry packs having a low sulphur content. Moistening, resulphuring, and further drying, as described above, restores the bright colour considerably. After rejection by hand picking of the pieces which do not respond to treatment, the parcels are rendered marketable. Prior to reconditioning, the parcel should be classed according to colour, in order to allow differential treatment of the various classes. Inspection during sulphuring will indicate the extent of sulphuring necessary.

(*g*) *Reduction of Sulphur.*—Over-sulphured apricots can be reduced in sulphur dioxide content to below the prescribed maximum by immersion in a 10 per cent. solution of hydrogen peroxide (10 volume) for fifteen minutes, followed by draining and re-drying. This treatment has been adopted when reductions of the order of 6 to 8 grains of sulphur dioxide have been necessary. In other cases, where only a slight reduction is required, such reduction normally occurs during storage in the moist packed condition, or may be effected by moist packing parcels showing excessive sulphur in the dry state.

PRUNES

Fruit Prior to Drying

(*a*) *Varieties of Plums.*—While d'Agen and Robe de Sargeant are recognized varieties for prune production, others are known to produce a satisfactory prune while some definitely are not suitable. From this point of view, plums may be divided into two classes:—

Suitable for drying: d'Agen, Robe de Sargeant, Splendour, French, Fellenberg (Italian), Imperial and Sugar.

Unsuitable for drying: Golden Drop, Angelina Burdett, President, Giant and Grand Duke.

(*b*) *Cultural Methods.*—Emphasis should be laid on the fact that cultural methods play an important part in prune quality. Although cultural operations are not directly connected with processing, they obviously have a very important bearing on the quality of fresh fruit, and this is a first essential in the production of high-grade prunes. Particular attention, therefore, should be paid to pruning, thinning, and to such general cultural methods as are necessary to ensure first-class fruit. Under present cultural conditions in some districts it has been noted that there is a marked variation in size, colour, and sugar content at stage of maturity of the plum on each tree, and that the majority of the plums at harvest are small and light. A uniformly high quality pack is not possible under these conditions.

(*c*) *Elimination of Unsuitable Fruit in the Field.*—The first plums to ripen are, as a rule, somewhat deficient in sugar. This premature drop of plums, coloured but not matured, should be cleared from beneath the trees to prevent contamination of mature fruit falling later, and should be disposed of immediately it has been processed.

Apart from these first-ripening plums, fresh fruit, ready for drying, may be divided into three classes—viz., wilted, or fruit which ripens and wilts on the tree and then drops; full ripe, which has not wilted; and unripe. It has been definitely established that for most varieties the first class of fruit produces the highest quality prune, and, further, that there is a fairly high proportion of unripe fruit in a crop which, if not separated, will materially reduce the general quality of the pack.

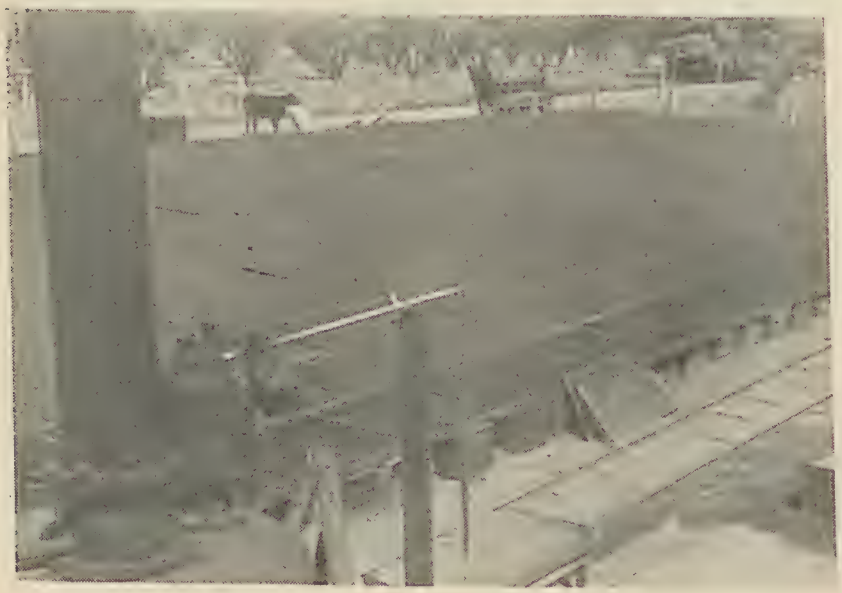
Plums, therefore, should be allowed to ripen and drop from the tree, and these should be collected every two or three days. Any shaking of the branches should be very gently performed to avoid dislodging immature plums. In order to produce a pack of the highest quality, it is essential to grade the plums at harvest into two classes, wilted and full ripe, which should be kept separate, and to discard all other fruit. This initial grading must be done if high quality, with resultant higher prices, is to be obtained.

Drying.

(*a*) *Dipping Prior to Drying.*—The dipping process is by no means standardized, and the best French prunes are not dipped at all. When dipping is practised, prunes are dipped as soon as possible after gathering, the usual dip being a caustic soda one. The correct strength depends on variety, maturity, and climatic conditions, and can be determined only by trial. For certain fruit, particularly when it is to be dried in a dehydrator, 1 lb. of caustic soda to 40–50 gallons of water has proved satisfactory. In other cases 1 lb. to 12–30 gallons has been successfully used, particularly when sun-drying. This stronger dip will not adversely affect plums at the correct stage of maturity. A constantly-boiling dip is essential, and it is generally agreed that it should very slightly crack the skin of most of the prunes.

Cracking of the skin should be barely noticeable, as more pronounced cracking is undesirable. The dip is momentary, and fruit should be spread on trays at once. Dips other than the caustic dip have been tried, and it would appear that, within limits, the nature of the dip is relatively unimportant, provided the dip is maintained at the boiling point.

(*b*) *Drying.*—If the weather is very hot, trays first should be stacked to prevent "case hardening" and "boiling" of the fruit, with loss of juice, and then exposed to the sun except in very hot periods. Prunes are dried on single-tier, wire-netting racks also. They dry more slowly by this method, but are not likely to suffer the same degree of damage by rain. Information is lacking as to the optimum moisture content desirable at the completion of the drying period, but the prune must be sufficiently dry to store indefinitely in bulk and to allow the addition of further moisture during processing. A slightly harsh condition at this stage is safest if deterioration of the desirable blue-black colour is to be prevented during storage. This harsh condition is undesirable in fruit for sale, but is only temporary in the case of fruit designed for moistening and further processing.



Prune drying.

(*c*) *Sweating.*—When dry, prunes are suitably stored in bulk for five or six weeks. During this period slight fermentation takes place, and the product assumes a uniform moisture content. Care should be taken to turn the fruit from time to time. This can be conveniently carried out by tipping the fruit from one box to another.

Factory Processing.

Apart from size grading and hand picking of faulty fruit, it should be an invariable practice to process dried prunes with a view to increasing the moisture content and producing a moist pack. This may be done by steaming or dipping. It is probably undesirable to add to the dip bath many of the concoctions sometimes used, but certain simple additions may be of benefit. When dipping (usually done in a wire basket) the prunes should be totally submerged in boiling water. The period of dipping depends on the condition of the dried prunes, and may extend to three minutes with very dry fruit. The dipped prunes are thickly spread on drying trays or sweat boxes, and as soon as the surface of the individual fruits is dry they should be packed.

Sun drying of fruit.

Boxed Prunes.—From the information available it would appear that the moisture content of the boxed processed prune should range from 20 to 25 per cent. Moulds are liable to develop with moisture contents greater than 25 per cent. Recently processed prunes are more attractive than those which have been processed for some time; consequently it is desirable that dry prunes should be processed progressively according to market requirements. After prolonged storage prunes which have become unattractive may be re-processed with advantage.

In order to produce a uniform pack by a standard procedure it is desirable to process prunes at one central factory rather than at a large number of small centres.

Dessert Prunes ("Dry-pack" Canned Prunes).—The following procedure for canning dessert prunes is that recommended by the Horticultural Division, New South Wales Department of Agriculture:—

The prunes, as they come from the sweat after completion of drying, should be thoroughly graded. The larger prunes only should be processed as dessert prunes (as a rule, counts greater than 67/70 should not be used).

The prunes, in dipping baskets, should be thoroughly rinsed in cold water, and then placed in sweat-boxes and allowed to "cold sweat" for at least 36 hours. If convenient, sufficient fruit may be dipped to provide for two or three days' processing, as prunes are not harmed by holding them in a moist state for a few days, and possibly may be improved. After this "cold sweat" they should then be exposed direct to steam at a pressure of 5 lb. for a period long enough to render the skin quite tender and the flesh soft. During steaming the prunes should be held in wire dipping baskets or some receptacle that will allow the steam to circulate freely amongst them. The period of steaming necessary will vary with the condition of the prune, and can be determined only by test; trials have shown that the variation may be from 10 to 25 minutes. The period necessary may be arrived at by testing at intervals several prunes between the front teeth until the required tenderness of skin is reached. The skin should be sufficiently tender to offer no appreciable resistance to the teeth when bitten. When steaming is completed the prunes should be packed into lacquered tins while still hot. The skin of the steamed prune will toughen appreciably if the fruit is allowed to cool for more than fifteen minutes.

When packed, the air is exhausted from the cans, which are then sealed and sterilized. Ten minutes' exhausting with vents open, partially submerged in a boiling bath, and 25 minutes sterilizing with vents closed, totally submerged in bath, was found satisfactory for cans 5 inches by 4 inches over all, packed with 29 oz. of steamed prunes. Fifteen minutes' exhausting with vents open, partially submerged in boiling bath, and 30 minutes' sterilizing with vents closed, totally submerged in boiling bath, was found satisfactory for cans 7 inches by 6½ inches over all, packed with 6¼ lb. of steamed prunes.

Where facilities for steaming under pressure are not available, the prunes may, after cold wet sweating, be dipped in boiling water to soften the skins and flesh. The length of the period of dipping must be judged in a similar manner as for steaming. Generally, however, dipping cannot be extended beyond twelve minutes, as the prunes commence to break up. When dipping is completed the prunes are packed while still quite hot, and the cans exhausted and sterilized as already described. Prunes cooked in this way have a distinctly different flavour from that of prunes cooked by steam, and while this flavour may suit some palates, the prunes lack the glossy appearance of the steam product, which is apparently preferred by the consumer. Consequently the boiling water dip cannot be considered a thoroughly satisfactory method commercially. A process in general use in South Australia is as follows:—

The prunes are washed in clean cold water and then immersed for from ten to fifteen minutes in boiling dip, made from water and prune juice, with a strength of from 5 deg. to 8 deg. Beaumé. The fruit is then placed in tins while hot, sealed and steam sterilized for from 20 to 30 minutes with a steam pressure of from 3 lb. to 4 lb. per square inch.

Tests have shown that processed prunes, when turned out of the can, will remain in satisfactory soft condition for 36 hours and, if allowed to remain in the open can, for 72 hours. After these periods the skin of the prune toughens appreciably. It can be judged, therefore, that if the processed prunes are packed in a container not air-tight, such as a carton, the prunes will need to be consumed within three days of packing; otherwise the skin of the prunes will become too tough for dessert prunes, and the fruit could be classed only as stewing prunes.

APPLES

The committee has not yet carried out any investigations into the drying or dehydrating of apples, but it submits the following procedure, compiled and published by Mr. W. M. Carne, Department of Commerce:—

Fruit Prior to Drying.

(*a*) *Varieties.*—Heavy varieties (mid-season to late) give the best drying ratios. Gravenstein and Ribston appear to be best of the early varieties, although the ratio is inferior to later types. Sturmer, Cleopatra, Rome, Stone and Dunns (and probably Granny Smith and Rokewood) are among the best; Jonathan gives rather a low ratio.

(*b*) *Condition and Sorting.*—Apples should be mature, ripe but crisp, and not mealy. Those with rots, or of very irregular shape, or with flesh injuries (including codling injury) or bad bruises, should be discarded. The fruit should be free from grit and dirt, which may injure the peeling knives. Effective sorting ensures maximum output from the peelers.

The most economical sizes of fruit are from $2\frac{1}{2}$ to 3 inches diameter. Over 3 inches, difficulty may arise in peeling, although $3\frac{1}{4}$-in. fruit is very economical if the peelers can handle this size satisfactorily. The larger the size, the less the waste and the less the time required per ton of apples for peeling and trimming; for $2\frac{1}{4}$ inches, the time is about double that for 3-in. fruit.

Preparation of Fruit.

(*a*) *Peeling and Coring.*—Care should be taken to see that fruit is properly centred on the coring knives to ensure maximum removal of core cells. Very irregular fruit is difficult to centre, does not peel well, and requires undue trimming. A common defect of the Australian dried product is the excessive occurrence of seed cells. This can be reduced by the installation of seed-celling equipment, which takes out the seed cells without taking out a large core from the rest of the apple. The use of $\frac{7}{8}$-in. coring knives instead of the standard $\frac{5}{8}$-in. reduces the seed cells left, but increases waste. Seed-celling machines are necessary for a high-grade product.

(*b*) *Trimming.*—There should be sufficient trimmers to handle the fruit as fast as it comes from the peelers. They must remove any skin left by the peelers, and also all discoloured flesh. Apples requiring much trimming should be discarded. Effective sorting before peeling reduces the amount of trimming necessary. Stainless steel knives should be used by trimmers.

If the delivery of apples from peelers is too fast for the trimmers or the slicing plant, the peeled apples should be placed in a brine bath (3 to 5 per cent. common salt) to prevent browning before sulphuring.

(*c*) *Slicing.*—Ring slices are best known and are preferred, but other slices and quarters (or orange slices) are permitted under export regulations, but must not be mixed. To avoid mixing, only one type of slice should be cut. Ring slices should be cut to $\frac{1}{2}$ inch and

quarter slices about the same thickness at the thicker side. Where centreing is not automatic, care should be taken to see that the apples are properly placed for ring slicing, as the quality increases with the percentage of rings. Quarters mean slices (orange slices) of any thickness, cut like orange segments.

Halving and pitting peaches for drying.

Sulphuring

Sulphuring in some form is essential. It helps to preserve the flavour and nutritive value and checks insect attack. It stops browning during drying and the effect persists long enough after drying to preserve the colour for some time, the time depending on the conditions of storage and the sulphur content.

Three methods of treatment are in use:—

(i) *Sulphur fumes only.*—(*a*) *Before slicing,* the peeled and cored apples are carried by a conveyor or elevator, through a long sulphuring box which is charged with heavy sulphur fumes from a sulphur stove. The time required is 45 to 60 minutes. (*b*) *After slicing,* (1) the slices are passed through the sulphur box as with whole apples, but the time may be reduced to 30 minutes; (2) the slices are spread thinly on trays which are stacked on trucks and run into a sulphuring chamber and sulphured for 30 minutes.

(ii) *Metabisulphite treatment.*—Slices are dipped in the following solution:—

Potassium metabisulphite, 2½ lb.
Citric acid, 2 oz.
Water (soft, preferably rain), 20 galls.

drained for a few minutes to save the solution and then sent to dryer.

(iii) *Combination treatment.*—North American experience indicates that the best method is a combination of sulphuring and dipping using sliced and not whole fruit. The sliced fruit is first dipped in the metabisulphite solution and then sulphured for 15 to 20 minutes.

As a tendency to discolour rapidly has been a defect of the Australian product, the effectiveness of the method adopted should be carefully watched. Browning is hastened when the dried fruit is exposed to warm temperatures, and if the water content is high, that is, above 24 per cent., direct sunlight tends to turn the fruit pink. Tests should be made with finished dried fruit in a warm place at about 70°F.; if browning occurs rapidly, the sulphuring treatment should be varied or resulphuring after drying adopted. Cool storage is desirable for stocks, especially if resulphuring is not practised.

When dry rings show a tendency to early discolouration, or have to be held more than a month or so in the ordinary storage, resulphuring after drying is desirable. Exposure to sulphur fumes for twenty minutes is sufficient.

Drying

Efficiently designed and controlled dehydrators have been found in North America to produce a better article than evaporators, and in about half the time. Modern apple dehydrators are especially designed for hot-end loading. Experience in Canada has shown reversal of loading in the tunnel type dehydrator, designed originally for cool-end loading, is not so satisfactory. This is the type used in Australia. Danger of scorching increases with the dryness of the fruit; 165°F. is approximately the danger point. In the cool-end loaded dehydrators used in Australia the temperature at the hot end should be maintained as nearly as possible at 160°F. The humidity of recirculated air, as shown by the wet and dry bulb thermometers, should not be allowed to exceed 65 per cent. by regulating the intake of outside air. Proper drying is essential and the moisture content should be about 18 per cent., with a maximum of 23 per cent.

Trays should be of well-seasoned wood with the floor made of narrow slats spaced 5/16 inch apart. The wood should be of a kind not likely to stain or cause odours in the fruit. The nails should preferably be cement-coated to prevent discolouration of the fruit; ordinary wire nails should not be used. New trays should be warmed, greased with hot tallow and then placed in a hot place or in a dehydrator to allow the tallow to soak into the wood. Greasing reduces the tendency of the fruit to stick to the wood. Trays should be kept clean from brown deposits, which may stain the fruit, by washing with warm water. (Some apples are sun-dried. After sulphuring, the slices are spread about one layer thick, either on ½-in. mesh wire trays, the wire having previously been brushed with hot paraffin wax or on clean wooden trays. The fruit should be turned several times during the day. When nearly dry, about six trays are tipped on to one tray and placed for about one hour in the sulphur box. W.R.J.)

Sweating or Curing

Different batches and different parts of the same batch will vary in moisture content after drying. It is necessary to bulk the fruit in heaps or wooden bins to a depth not exceeding 4 feet to secure uniformity of moisture. Sweating should go on until the fruit is uniform in moisture and pliable in texture. This may take from one to several days. Sweating is hastened by turning the fruit and by covering. Over-dry brittle batches may be mixed with less dry fruit, or brittle batches may be moistened slightly by sprinkling with the metabisulphite solution as the fruit is turned. The final desirable moisture content is about 23 per cent. Until experience has been gained in assessing moisture content, the assistance of Department of Agriculture chemists in determining the moisture content of samples is advised.

The sweated product should be passed through a rotating screen with a 1-inch mesh, to remove small pieces, seeds, &c. The chips can be screened again using a ⅝-inch mesh to remove seeds, &c., and to produce a chip grade for local use.

FACTORS ESSENTIAL TO PRODUCE A HIGH-GRADE PACK

General

The processing details already outlined have indicated the various points to which strict attention must be paid to ensure a successful and high-grade pack. Some of these points warrant reiteration in summarized form, with stress on the influence they exert on keeping qualities.

Hand picking, commenced in the field and completed in the factory, should be sufficiently thorough to ensure uniformity in colour. A standard of texture, shape and quality of size is defined by the Department of Commerce and judged by inspection.

Little trouble is experienced with the sun-dried pack, in which moisture usually ranges from 12 to 15 per cent.; dry-pack fruits which retain a bright colour at the end of the drying period usually keep satisfactorily. In dry packs, extreme dryness, associated with harshness, should be avoided.

Moist packing has now been practised in Australia for a number of years, and it is with the moist pack that particular care is necessary to ensure keeping quality and a high-grade product. Until recently, such fruit usually was packed in paper-lined boxes. Under these conditions of packing, sulphur dioxide content decreases on storage, and values over the prescribed maximum are rarely experienced by the time the fruit is marketed. Dried fruits for the use of the armed forces are now packed in airtight, sealed, tinplate linings within wooden boxes. Under these conditions, no loss of moisture and little change in sulphur dioxide content is to be expected, and a more careful observance of moisture and sulphur dioxide standards is necessary.

Apricots

For the dry pack, keeping qualities remain satisfactory with sulphur dioxide somewhat lower than the prescribed maximum (American experience suggests 11 to 12 grains per lb.), but apricots intended for the moist pack should have a high initial sulphur dioxide content, even exceeding the maximum of 14 grains per lb.

Moist packed fruit is usually subject to progressive darkening during storage, a serious defect when such darkening becomes pronounced. Excessive darkening subsequent to packing is a common form of deterioration associated with low sulphur dioxide and accentuated by excessive moisture. The permissible maximum sulphur dioxide content in fruit offered for sale (14 grains per lb.) is statutory and must be observed. For the moist pack, the sulphur dioxide must be right up to this maximum at the completion of processing to ensure sound keeping in various conditions of storage.

The moist pack in sealed tin linings or in boxes for export should contain not more than 20 per cent. moisture, and in boxes paper-lined for local consumption, not more than 25

per cent. At present, when destination and duration of storage are frequently unknown, a maximum moisture content of 20 per cent. should be observed for all moist pack apricots.

Peaches and Nectarines

Peaches and nectarines darken quickly with the present technique of moist packing, and these fruits should therefore be packed in the sun-dried condition—at least until a satisfactory moist pack technique has been evolved. These fruits retain less sulphur dioxide than apricots, and there is little risk of over-sulphuring.

Pears

The processing of pears, which are invariably packed dry, is practically confined to the field, and improvements that can be effected in the packing shed are limited. Attention to grading for size and appearance, and attractive packing, are the chief requirements. It is very difficult to over-sulphur pears; rather, it is difficult to ensure adequate sulphuring. If satisfactory at the end-point of field processing, pears usually retain their condition subsequently, unless exposed to very moist storage conditions.

Prunes

Evenness of size, softness in the skin and entire absence of mould (even after being exposed to the air for some time) are essential requirements in a high-class pack. The dry-canned or dessert prunes should have a moisture content not in excess of 33 per cent.; the boxed prune, a maximum of 25 per cent.

Apples

It is difficult to over-sulphur apples; investigations are now under way to determine the optimum sulphur dioxide content in dried apples, both in paper and tin-lined containers. Dried apples should not contain more than 24 per cent. moisture; the higher the moisture content the more quickly the fruit will deteriorate. Stocks should be held in cool storage, especially if the fruit has not been re-sulphured after drying; this checks browning, excessive drying and insect infestation.

PEST CONTROL

Fumigation

All boxes or tins of dried fruit should be fumigated at the packing point to ensure the destruction of any insect pests which may be present. One of the most convenient and efficient methods available is fumigation of each individual box with ethyl formate; this method has been used with satisfactory results by most of the dried fruits packing houses for a number of years. The fumigant, ethyl formate, is manufactured in Australia and sold under the trade name "Eranol Z3." It is a volatile liquid, and is poured on top of the fruit immediately before the lid is applied. The dosage employed is 10 ccs. (approximately one dessertspoonful) for 56 lb. boxes; 5 ccs. for 28-lb. boxes; 7 to 8 ccs. for 56-lb. tins; and 4 to 5 ccs. for 28-lb. tins.

This treatment does not harm the fruit nor affect its flavour. Where the fruit is packed in boxes without tin linings, the ethyl formate evaporates and disappears within a few hours. Where tin containers are used the vapour also disappears, though somewhat more slowly, as a result of hydrolysis to formic acid and ethyl alcohol; these substances are quite harmless in the concentrations likely to be present.

With an insect-proof container, such as a properly sealed tin, reinfestation cannot take place, but in the case of fruit packed in wooden boxes without tin linings, reinfestation may occur at any time after the ethyl formate has disappeared.

Proper orchard management is essential for the production of good dried fruit.

METHODS OF ANALYSIS

Determination of Sulphur Dioxide

The standard method recommended is the Monier-Williams Method(*). For packing-house control purposes, a rapid "workshop" method (see below) is considered to be sufficiently accurate. The use of more accurate methods is not usually warranted on account of the very large errors involved in sampling lines of fruit in the packing houses.

"Workshop Method."

(*a*) *Solutions Required.*—One-tenth normal iodine solution containing 12·7 grammes of iodine and 18 grammes of potassium iodide per litre. To be kept in a brown or blue coloured bottle. Starch solution prepared by adding one teaspoonful of potato starch to about two cups of boiling water and continuing boiling for a few minutes. To be made fresh daily.

(*b*) *Apparatus Required.* — Stoppered bottles: a number of wide-mouthed glass-stoppered bottles of about 600 ccs. capacity. In an emergency, screw-stoppered lemonade bottles will do, but are not nearly as convenient as the wide-mouthed glass-stoppered bottles. One 50 cc. burette. Rough chemical balance and set of gramme weights. Small mincer. Burette stand.

(*c*) *Method.*—Exercise care in obtaining a representative sample, which should then be "quartered down" until about ¼ lb. remains. Pass this final ¼ lb. sample twice through a small mincer. Weigh carefully 44 grammes of the minced sample and transfer to the stoppered bottle. Add about 500 ccs. (say two cups) of water. Insert stopper and shake well every ten minutes until two hours have passed. Add about a teaspoonful of the starch solution, and then run in iodine solution from the burette. The iodine solution should be added in small amounts, 1 cc. at a time, towards the end of the titration, shaking vigorously for fifteen seconds after each addition. The titration is finished when the blue colour produced by the last addition of iodine persists after fifteen seconds' shaking. Each c.c. of iodine used represents 1 grain per lb. of sulphur dioxide, so that the sulphur dioxide content is simply the burette reading in ccs.

(*d*) *Special Notes.*

(i) A green colour shows that too little starch solution has been added; repeat test with more starch.

(ii) If gramme weights are not available, a two-ounce sample may be used, in which case the number of ccs. of iodine used multiplied by ·78 gives grains of sulphur dioxide per lb.

(iii) The iodine solution and the apparatus may be obtained from suppliers of chemical apparatus at a small cost.

(iv) The method is admittedly approximate. For the purpose in view it is sufficient to know the sulphur dioxide content to within plus or minus 1 grain per lb.

(v) By using a number of bottles, a considerable number of determinations can be made in a relatively short time.

(vi) The method is obviously an empirical one, and it is therefore essential that the directions be adhered to rigidly.

(vii) Some testers prefer to use the following modification of this method: use 22 grammes of sample and, after the water, add 25 c.c. caustic soda solution (4 per cent.). Just prior to titration add 10 c.c. dilute sulphuric acid (500 c.c. water with which 100 c.c. concentrated sulphuric acid have been cautiously mixed. Again, each c.c. of iodine solution represents 1 grain per lb. of sulphur dioxide.

Determination of Moisture

Moisture determination should be made on the edible portion of the fruit, discarding the stone.

The vacuum oven-drying method is considered to be the most accurate method for determining moisture in dried fruits as, when the necessary precautions are taken, it usually gives an end point which is slightly more definite than is the case with other methods, while causing only slight caramelization or other visible chemical changes. The official A.O.A.C. (†) method which stipulates drying for six hours at 70°C. in flat metal dishes, with special precautions as regards spreading, oven ventilation and pressure, has therefore been chosen as the standard method. Strict adherence to every particular of the prescribed method is essential. All other methods, such as the toluene distillation or the electrical conductivity methods, must be calibrated against this vacuum oven method.

For control purposes in packing houses the conductivity (moisture meter) method is the most convenient to use and, when properly calibrated and suitable tables are prepared,

(*) Methods of Analysis of the Association of Official Agricultural Chemists, 5th Edn., 1940, p. 463.
(†) Ibid, p. 336.

[*Continued on page* 110.

Drying Clingstone Peaches

Procedure Recommended by Fruit Processing Committee

CLINGSTONE peaches may be dried either peeled or unpeeled. While some varieties, e.g., Golden Queen, may not require peeling, most varieties do not yield a very attractive product unless peeled; the slight loss in peeling is more than counterbalanced by the more attractive, and more easily cooked, product. The Department of Commerce has stipulated that clingstone peaches must be peeled before drying.

The following procedure is essentially a commercial one, to be carried out on premises equipped with a dehydrator and other essential plant. It is not anticipated that individual growers will process clingstone peaches, but they could do so if, after peeling and sulphuring, the peaches were sun-dried.

Maturity

Peaches should be picked well-coloured but firm, and allowed to stand in cases to ripen further. After one or two days the ripe, but still firm, fruit is picked out for processing, and the remainder left for further maturity; fruit which fails to mature properly should be discarded. It is essential to prevent bruising as mould growth will develop where bruising is severe. Clear skinned varieties, e.g., Golden Queen, are more susceptible to bruising than others, but are easier to peel. More care in selecting the fruit at the right stage of ripeness is necessary with Pullars, to ensure easy removal of the skin.

Peeling Treatment

Peaches are halved and pitted and the halves spread on trays, if an unpeeled peach is to be produced. For peeled peaches, the halves are treated in a lye bath in the same way as for canning; the boiling, dilute solution of caustic soda removes the skin by dissolving the pectin cells that exist between the skin and the peach proper. The caustic soda bath varies in strength between 1 and 5 per cent., but is usually between 1½ and 2 per cent. (1½ to 2 lb. per 10 gallons of water). The bath is kept boiling and the time of immersion varies from ½ to 1 minute; the exact strength of the lye and the time of immersion are determined by trial and should result in the whole of the skin turning black.

The peaches are then rinsed in, or passed under jets of, clean water to remove the blackened and loosened skin and to wash off the lye. The fruit is hand picked for size and blemishes, and spread on trays, cups upwards.

Sulphuring

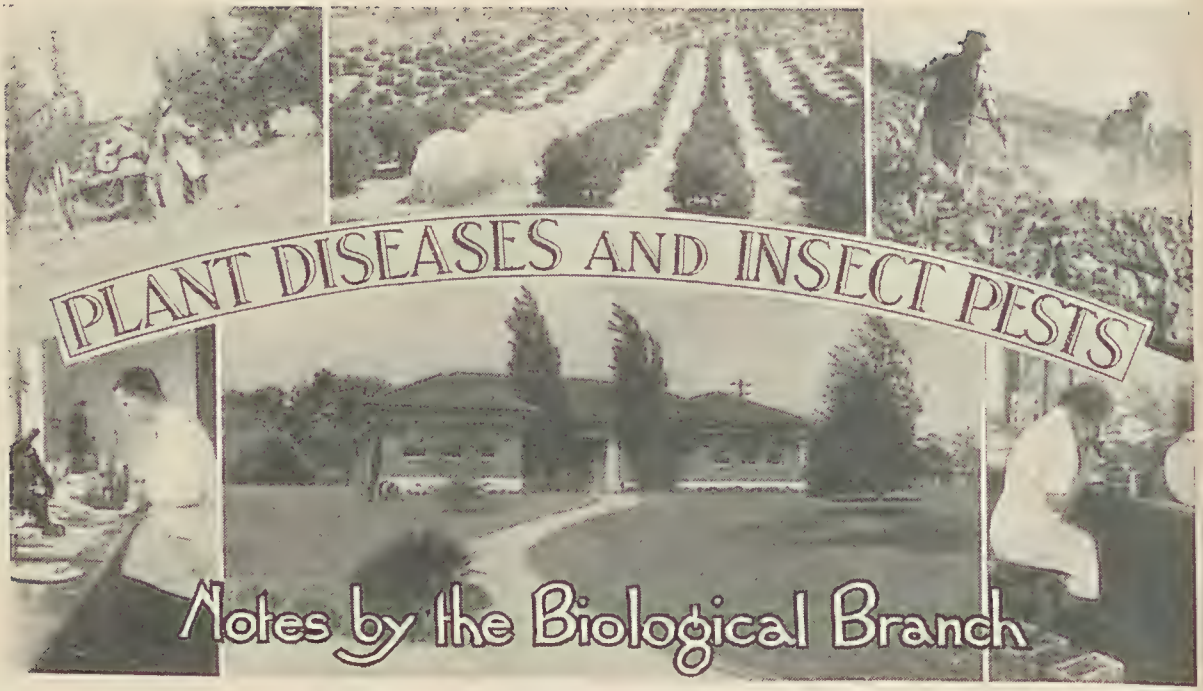
The trays are placed in a sulphuring box and sulphuring should be carried out by the continuous fume method as soon as possible after the fruit has been placed on the trays; the construction and operation of the sulphur box have been fully described in the article "Drying and Processing of Tree Fruits" (Sulphuring Apricots), published in this issue.

Peaches, unlike apricots, cannot easily be over sulphured and, whether peeled or unpeeled, sulphuring overnight (about 16 hours) is advocated, although a shorter period of about 6 hours is possible with peeled peaches. Dried peaches darken more readily than apricots and heavy sulphuring is essential if a satisfactory storage life is to be obtained. The sulphur dioxide content after drying should approach the legal limit of 14 grains per lb. and should not be less than 10 grains.

Dehydration

The trays are taken from the sulphur chamber direct to the dehydrator. Temperatures up to 160° F. can be used without darkening the product, but 145 to 155° F. is the recommended temperature range. The time in the dehydrator should be from 20 to 24 hours; it is difficult to dry all pieces uniformly without an unduly long time in the dehydrator and the final stage of drying is slow. It is strongly recommended to remove the trays at the end of about 24 hours and while the fruit is still somewhat moist, and to finish drying by exposure to the air in the

[*Continued on page* 104.



"LEAK" OR "WATERY WOUND ROT" OF POTATOES

The fungal disease of potatoes commonly known as "Leak" or "Watery Wound Rot" is not widespread in this State, but is more or less restricted to soils rich in organic matter, such as are found in the Koo-wee-rup Swamp district and parts of the Western District.

Serious losses occur in transit and storage, particularly when the potatoes have been dug during warm weather.

The disease is caused by a soil inhabiting fungus (*Pythium de Baryanum*) well known as a cause of "damping-off" of seedlings. Infection always occurs through an injury such as may occur during digging or as a result of sunscald.

The general appearance of a tuber infected with this disease through a fork injury, is illustrated. The dark brown tissue surrounding the infection point is soft to the touch, the skin separates from the underlying rotted tissue very readily, and is followed by an exudation of a brown watery fluid as the potato "leaks." The disease progresses very rapidly and a potato may completely decay in one or two days after becoming infected.

The most important control measure is a rotation of four to six years. Crops which may be safely included in the rotation are pasture, oats, onions, maize, peas. By this means, the fungus is starved-out of the soil.

"Watery Wound Rot"—Natural infection at a fork mark.

The practice of leaving decaying tubers on the land after the crop has been lifted increases the incidence of the fungus in the soil. Diseased potatoes should be collected and destroyed, preferably by burning or by burying deeply in an area not used for the growing of potatoes.

Special care in the digging and bagging of the crop is necessary in districts where the trouble is known to occur, and the following recommendations will all assist in reducing the degree of infection :—

(1) Digging should be confined to cool weather or at least to the cooler parts of the day as disease development is most rapid when the temperature is high.

(2) It has been demonstrated that less disease occurs in consignments, when potatoes are dug during warm weather, if "short runs" are lifted and then "picked up" in preference to leaving the potatoes on the hot soil for long periods.

The early removal of bags to a cool situation after "picking-up" is also important.

(3) Special care should be taken during digging to avoid injury and only sound tubers should be bagged.

(4) Loading hooks should not be used on bags of potatoes grown in districts where this disease is known to occur, as they may cause wounds which may become infected from soil adhering to the tubers.

Tomato leaves affected with Target Spot or Early Blight.
[After *Samuel.*

EARLY BLIGHT OF TOMATOES

Early Blight of tomatoes is a disease favoured by moist conditions and fairly high temeratures.

The disease is caused by the fungal parasite, *Alternaria solani,* which also attacks potatoes and related plants. If favourable conditions occur early in the season, the disease may appear in the seed-bed and can be recognized by the presence of irregular dark-coloured spots which first appear on the lower leaves. As the spots enlarge, they may develop a series of concentric rings. The parasite is not restricted to the leaves but may attack the lower stem region, causing a collar-rot condition and the subsequent death of the infected plant.

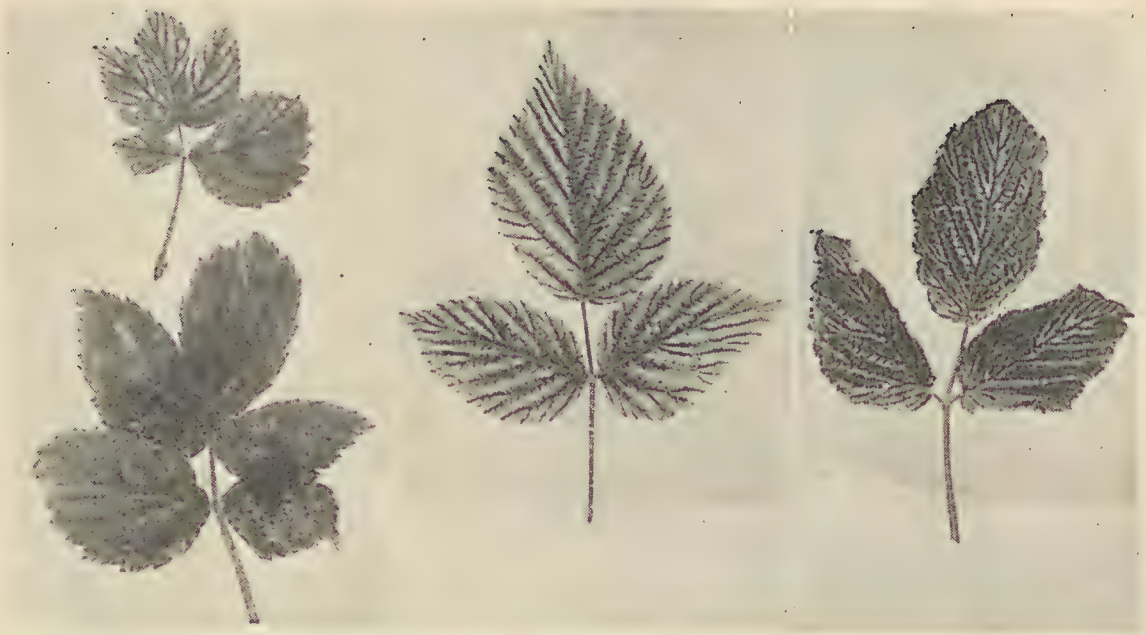
The appearance of the disease in the field decreases the yield by causing partial defoliation, thereby reducing the vigour of the plants and exposing the fruits to sunburn.

The fungus is also capable of entering the fruit through insect punctures, wounds or growth cracks. Sometimes very heavy storage losses are incurred particularly in early season tomatoes, which are usually held in ripening rooms after being transported from Western or South Australia. Under the warm humid conditions of the ripening rooms, the almost inconspicuous diseased spots on the fruit enlarge very rapidly and a fungal mould develops on the diseased areas as the fruit decays.

Seedling plants should be protected with a 7 per cent. copper dust, and the same dust can be applied in the field if it becomes necessary. Bordeaux spray is not recommended because it is doubtful whether the injury incurred by the plants during spraying is offset by the control of the disease. The yield of fruit may be reduced more by the spray than by the disease.

RASPBERRY MOSAIC

During inspections of raspberry plantations in the Kalorama and Silvan districts of Victoria, it has come under notice that Raspberry Mosaic is present in Victoria. This disease is regarded with the greatest seriousness in America and two quotations clearly indicate the attitude of Americans to the disease. W. Howard Rankin states that, "Mosaic is the limiting factor which has caused the general abandonment of Raspberry culture in New York" (New York Agr. Exp. Sta. Bull. 543) and C. W. Bennett states that, "Virus diseases (including



Leaves infected with Raspberry Mosaic. Note distortion of upper leaf in the illustration at left. Centre and Right—Leaves showing symptoms of a physiologic disorder. The centre illustration shows the second phase of the disease, and (right) the third phase.

mosaic) as a group are by far the most destructive of all the raspberry troubles," (Michigan Technical Bulletin 80). It is, therefore, directly in the grower's interest to familiarise himself with the symptoms of this disease so that he will be able to detect its presence on his property. He will probably be only too well aware of the devastation caused to the strawberry industry by the virus disease known as Crinkle (popularly, but incorrectly, referred to as "wilt" in parts of the berry-growing district). It is hoped that early action will prevent a similar disaster in the raspberry industry.

Symptoms of the Disease

The most conspicuous symptom of the disease is a pale green to yellowish mottling of the foliage. This is more evident in the young growth and frequently may be accompanied by considerable distortion of the leaf as shown in the upper leaf of the illustration to left. A less evident, but more important symptom, is the lowering of both the quality and yield of fruit. The mottling of the foliage, whereby the disease may be recognized, is best detected by the grower casting his shadow over the plant and carefully examining the young growth. Apparently, the symptoms of the disease remain throughout the season, but the best time to carry out an inspection for this disease appears to be in early December, though later in the season would possibly be satisfactory although there is a danger that hot weather would partially mask the symptoms.

It is not desirable to make the inspections very much earlier as a rather obscure condition, which is apparently due to physiologic causes, has been observed in the Kalorama district. In the earliest stage the symptoms are somewhat similar to mosaic. A faint mottle (much fainter than in the case of mosaic) is the first symptom of this trouble but it may be distinguished from mosaic by the complete lack of any leaf distortion. Later the mottling extends and the second phase of the trouble is the development of a cadmium yellow colour between the veins. The tissue in these areas later dies (centre illustration). If inspections for mosaic are made when the cadmium yellow colour has developed, there will be no possibility of confusion of the two disorders.

Nature of the Disease and its Transmission

Raspberry Mosaic is one of the class of virus diseases, which include such familiar troubles as Strawberry Crinkle, the complex group of viruses causing potato degeneration and Spotted Wilt of the tomato and other crops. Viruses are caused by agencies too small to be visible

through the most powerful microscope and members of the group can be transmitted by rubbing sap from an infected plant on to a healthy plant, by sucking insects such as aphids and thrips or by vegetative propagation such as budding, grafting or by suckers. Raspberry Mosaic is only known to be transmissible in two ways—by three species of aphids and by the selection of suckers from diseased plants. Fortunately none of the aphids capable of transmitting the disease are known to occur in Australia and so the disease is spread only by selection of suckers from diseased plants. Another fortunate feature of the disease in this State is that so far it has only been detected on the "Everbearing" variety of Raspberry. If growers detect the disease on other varieties, they should communicate immediately with the Biologist, Plant Research Laboratory, Burnley Gardens, Burnley, E.1.

Control

(1) As with most other virus diseases, there is no known method of ridding the plant of the virus once it has become infected.

Cabbage butterfly caterpillars on cabbage leaf.

[Britton and Lowry.

(2) Growers should remove infected plants as soon as possible and destroy them by burning. Owing to the high percentage of infection in the Everbearing variety, growers are strongly advised to discontinue culture of this variety. While at the moment, the virus seems to be confined to this variety, and fair yields are obtained in spite of the virus, it must be realized that one of the aphids which transmit the disease may be accidentally introduced to the State in the future. These aphids would then be capable of spreading the disease from the reservoir of infection present in the Everbearing variety, to all other varieties of raspberry causing great injury and considerably reducing the possibility of satisfactory control of the disease.

CABBAGE BUTTERFLY AND CABBAGE MOTH

Two of the most important pests with which the grower of cauliflowers and Brussels sprouts has to contend are the Cabbage Butterfly, *Pieris rapae L.*, and the Cabbage Moth, *Plutella maculipennis* Curtis. As planting out of both of the above-mentioned crops has commenced, growers are advised to take every precaution against pests right from the start, because once an infestation obtains a foothold, very little can be done in the way of producing an insect-free crop.

The damage caused by these insects is very frequently confused one with the other, probably because the White Cabbage Butterfly, which has only been in this country for some four years, is such a conspicuous object during the summer and early autumn months, whereas the Cabbage Moth is a small, grey night-flying insect, observed only when the crop is disturbed.

In their early stages, it is rather difficult to distinguish between the grubs of these two insects. There is one very important difference, however. The grubs of the butterfly make small holes right through the body of the leaf, and by constantly feeding, particularly if there are enough grubs present, they will eat out the whole of the tissue of the leaf between the main ribs. With the grub of the moth, the early feeding is confined to that part of the leaf, between the upper and lower surfaces, and as the feeding progresses, the whole leaf may take on a white, tissue-paper appearance.

As the grubs become more mature, the difference between the two insects becomes more apparent. The grub of the cabbage butterfly when fully grown measures roughly one inch in length, is dark green in colour, and rather sluggish in its movements, and moreover there is a thin orange stripe running down its back. The grub of the cabbage moth, on the other hand, varies a great deal in colour, being light green with the majority. It measures roughly $\frac{3}{8}$ of an inch in length when fully grown, and is particularly active and lively when disturbed. It falls readily off the leaf, usually on a fine, silken thread.

There may be as many as five or six broods of both of these insects throughout a season.

Control

As early damage to either cauliflower and Brussels sprouts crops can be caused by these insects, it is essential to commence treatment as soon as the young plants are established after planting out. Treatments should be continued at regular intervals, not exceeding ten days, and more frequently if large numbers of the insects appear.

A dusting treatment is recommended. The most satisfactory dust is a combined one, consisting of 50 per cent. of arsenate of lead and 2 per cent. of nicotine. The nicotine will satisfactorily control aphids which frequently occur, as well as destroying young grubs of these other insects.

With Brussels sprouts, the dust should be directed chiefly against the young sprouts forming up the stem, because once the grubs are allowed entry into the small sprouts, it is not possible to reach them. Sprouts treated in this way should be well washed prior to use. With cauliflowers, once the heart or "curd" has commenced to form, it is important to direct the dust at the leaves and away from the heart as much as possible as, in addition to exceeding the allowable amount of arsenic present on such vegetables, an excess of arsenic frequently causes the vegetable to turn black when cooked.

PREVENTION OF "WEEVIL" ATTACK ON GRAIN STORED ON THE FARM

Throughout the wheat industry the term "weevil" is loosely used to describe all insects infesting grain and grain products. Upon the farm, "weevils" are frequently present in barns and chaffhouses, and little or no precautions are normally taken against them. These insects, if left unmolested, will not only cause some losses to the individual farmer, but there is a grave danger that wheat leaving an infested farm at harvest may carry weevils to grain elevators and storage depots, and initiate serious weevil outbreaks in our stored wheat. It is, therefore, in the interests of every wheat grower to maintain his farm in a weevil-free condition.

Severe damage to wheat caused by the rice weevil.

The most common cause of insect damage to farm-stored grain results from inadequate attention being paid to periodic cleaning out of barns. When any grain is to be stored for an extended period on the farm, either a new, clean site should be chosen, or where this is not practicable, every effort should be made to render old storage sites free of insects. To do this, barns and sheds should be emptied of all old grain, which should not then be placed in close proximity to clean grain until it has been effectively fumigated. The barn should then be thoroughly swept out, and all loose grain and sweepings destroyed. Where the shed has a raised floor, the ground beneath should be examined, as loose grain which has fallen through cracks in the boards is frequently found to be heavily infested with weevils.

Following this thorough clean out, the shed should be sprayed with one of the oil emulsions prepared for the specific purpose of destroying weevils. In general it would be advisable to apply these sprays at a concentration of 1 gallon of the emulsion to 20 gallons of water. Both the floor and walls of the shed should be thoroughly sprayed. A further precautionary measure against carrying weevils off the farm is for farmers delivering wheat to grain elevators either to fumigate their bags with carbon bisulphide or to dip them in an oil emulsion prior to the commencement of the harvest. Further details of the most suitable type of oil for these purposes can be

obtained from the Biological Branch of the Department of Agriculture, Burnley.

Fumigation is one of the most effective methods of controlling stored grain pests. The success of fumigation is dependent on the gas tightness of the structure being fumigated, the temperature of the grain, and the amount and type of fumigant used. The cheapest fumigant for use on farms is carbon bisulphide. The vapour of carbon bisulphide is highly inflammable and explosive, therefore stringent precautions must be taken against fire hazards.

The normal dosage for carbon bisulphide is from 1 to 3 gallons per 1,000 bushels (or 1,300 cub. ft.) depending on the temperature of the grain and the tightness of the shed or bin. Fumigation with carbon bisulphide should not be attempted at grain temperatures below 60° F. Carbon bisulphide vapour is heavier than air, and the fumigant is normally applied by sprinkling it over the surface of the grain. Where the grain in a bin is more than four feet deep, one third of the dosage should be applied near the bottom of the bin through pipes. These pipes can be inserted if plugged with a rod to prevent clogging with grain. After the pipe is in place the rod can be removed to allow the fumigating liquid to be poured in. The surface of the grain is then covered with a tarpaulin for a period of 48 hours. Small quantities of bagged grain may be successfully fumigated under a tarpaulin or better still, in old tanks.

Wheat held on the farm for seed purposes should always be pickled, not only because of the fungicidal value of pickling compounds, but also because weevils will not attack pickled wheat.

In conclusion, farmers and wheat handlers generally must realize that weevil infestations do not generate spontaneously within the grain but are the direct result of allowing weevils to have access to clean grain. Thus it is the duty of every person in the industry to do his share in preventing the spread of weevils throughout the reserve stocks of wheat at present being stored in Australia.

FLIES

At the present period of the year, flies are extremely troublesome both inside and outside the house. Of the flies found inside the house, the common House Fly, *Musca domestica* L., is most usually encountered, while outside the biting Stable Fly, *Stomoxys calcitrans* Fabr. and the Bush Fly, *Musca vetustissima* Walk. are most commonly found. These latter species, particularly the Bush Fly, are almost entirely confined to outside locations.

The house fly.

The house fly, because of its well-known association with the transmission of such human diseases as typhoid fever, cholera, bacillary and amoebic diarrhoea, &c., should be regarded as one of the most dangerous of house infesting insects. Disease transmission is usually carried out mechanically. House flies visit, breed in and feed upon all manner of filth and refuse, including human excreta. The causative organisms of typhoid fever, cholera and dysentery all occur in the faeces of infected persons. Flies carry away these organisms on the hairs with which their body is covered, their feet or their mouth parts, and may then visit and infect any human food within the range of their flight, which is considerable. The habits of flies of moistening food with a "vomit drop" is important in the transfer of germs from the mouth-parts of the fly to human food. Viable bacteria have been recovered from the alimentary canal of the fly, so that even fly specks may be dangerous.

Life Cycles

The house fly breeds principally in horse manure, but also in human excreta, refuse from the kitchen or cookhouse, and decaying vegetation.

Eggs, which are white, elongated, and about 1/25th of an inch in length, are laid in batches of 100 to 150 in crevices below the surface of

the food material. These hatch in from 8 to 24 hours into small, white legless maggots, which, after feeding for some 3 to 7 days, become fully grown, and then measure ½ inch long. The maggots then enter the soil to a depth of a few inches or even more, when they turn into pupae. This stage lasts only 3 to 6 days, when the adult fly again emerges. Under favourable conditions, therefore, the house fly can complete its life cycle in 10 days, but, as usually 1 to 2 weeks elapse before the first eggs are laid, a complete brood may only occur once every three weeks in summer.

Control

Obviously, the main consideration here should be to prevent flies breeding. As flies only breed in horse manure, kitchen or cookhouse refuse, and human excreta, treatment of these materials is essential.

Horse Manure.—Flies are most attracted to horse manure which is less than three days old. Hence it is important to collect the manure regularly and frequently, and arrange for its disposal before flies can breed in it. This can be done either by incineration, tight packing, or chemical treatment. If chemical treatment is resorted to, borax dissolved in water at the rate of 11 oz. to 10 gallons and applied to 8 bushels of manure will kill eggs and maggots. Excessive borax will prevent plant growth, but 15 tons per acre of this manure will not injure plants.

Disposal of Garbage and Food Waste.—These materials are next in importance to horse manure as a breeding ground for flies. Such material therefore should not be allowed to lie about, but immediately placed in fly-proof containers for incineration later.

Disposal of Human Excreta.—This problem is entirely a sanitary one, and is essential to prevent disease transmission rather than for preventing flies breeding.

Control Measures Against Adult Flies.—Houses may be made relatively fly-proof by the use of flywire screens placed over all openings such as doors and windows, and kept in good repair. Wire doors should always open outwards. In actual practice this measure should always be regarded as auxiliary to others. Food should be screened by means of safes, covers, &c.

Where flies are present inside a house, the use of a pyrethrum fly spray is recommended. The room to be treated should be closed, and then filled with a fine mist of spray and left for half an hour. Out of doors, it will be necessary to spray the mixture directly on to the flies.

For a bait, a safe effective poison bait consists of three teaspoonsful of commercial formalin to 1 pint of milk or water with a little sugar added. This mixture can be put out in saucers containing blotting paper.

Fly paper and fly wires can be prepared by the use of the following mixture:—

2 lb. resin and 1 pint of castor oil. These materials should be heated together to treacly consistency, and then smeared on paper or wire for use.

Where wires are concerned, they can be used a second time by running through a flame, which must not be too hot to burn the mixture.

DRYING CLINGSTONE PEACHES—*continued from page 97.*

open for 2 to 4 days in stacked trays or in partly filled sweat boxes. This results in a reduced time in the dehydrator and in a product with a better appearance, as less twisting and shrivelling take place when final drying is completed slowly in this way. The average moisture content of the dried product should be within the range of from 14 to 18 per cent., with an optimum of about 15 or 16 per cent.

The dehydrator should be in sound condition and free from smoke, soot, and ash, as such foreign matter adheres firmly to the peach and ruins the product. For the purpose of calculating tray space required, each square foot of tray surface can be taken as holding about 2½ lb. of unpeeled and 3 lb. of peeled peaches.

General

Trouble may be experienced with sticking of peaches to wooden trays, particularly when of hardwood. To prevent this, coat the trays with melted paraffin wax and ensure that the surface layers of the wood are impregnated with the heated wax, without leaving a thick layer of free wax on the surface; the use of a painter's blowlamp is helpful in this connexion. Alternatively, painting with an odourless paraffin oil should also be effective. The dried fruit may be scraped off the trays with a baker's dough knife.

Peaches should be packed dry; no satisfactory procedure is at present available for "moist-packing" peaches, although experiments to this end are now under way.

PICKLES AND SAUCES

By the Fruit Preserving Expert

PICKLES, sauces and chutneys are a welcome addition to the meal table. They are not difficult to make, and are inexpensive compared with the factory prepared article, especially if vegetables and fruit from the home garden are used.

There are many vegetables, fruits, and herbs which are suitable alone or in combination for the making of pickles, chutneys, and sauces.

The pickles in which the flavour of vinegar predominates are usually spoken of as "sour pickles," and when the sweetness is more prominent they are called "sweet pickles," or "spiced fruit." These all make excellent preserves, and are usable in several ways. "Mustard pickles" are also a favorite with many, and "chutney" is a preserve well worth consideration. Tomato sauce, and other thick sauces may be made with different flavourings. The "liquid" sauces include mushroom ketchup, Worcester, &c., while there are quite a number of the aromatized vinegars and dried herbs which will be found very appetizing.

Vinegar

Vinegar, with or without the addition of spices or sugar, is used as a temporary preservative in the making of pickles and sauces. Spices, salt, and sugar have somewhat the same effect on bacteria as vinegar, although in a different degree; but they are valuable, apart from their qualities as preservatives, for the flavour they impart.

Vinegar also has the power of softening the cellulose of green or undeveloped vegetables and fruits, thus rendering some unpromising substances acceptable as condimental foods.

Only the best vinegar should be used for pickling. White vinegar gives the better appearance to clear pickles, but in all pickling malt vinegar is preferable because it gives a better flavour.

When adding spices to vinegar, they should be tied in a muslin bag, added to the vinegar, which then should be brought just to boiling point. It is important to have the lid on the saucepan during this process, otherwise most of the flavour is lost. The vinegar should then be removed from the stove and allowed to stand for two hours or longer. The spice bag should be lifted out, when the vinegar will be ready for use. Vinegar should not be boiled as it contains acetic acid, which is volatile and when boiled loses its strength.

When pickling vegetables such as cabbage or onions, which should be crisp when ready to eat, placing them in cold vinegar will give the better results, while hot vinegar is better for the softer types of pickles, such as walnuts and plums.

Spices and Flavouring Agents

The following classification of a few commonly known spices and flavouring agents which are frequently used in pickling may be helpful:—

Mace. Cloves. Cinnamon.	Protective.
Mustard. Nutmeg. Pimento or allspice.	Partly or semi-protective, and are valuable for the flavour they impart.
Ginger. Pepper. Cayenne.	To give flavour to the food and to aid digestion.

Turmeric is added to give colour.

Salt is employed as a preservative, and also as a seasoning.

Horseradish is thought to retard the growth of mould.

Vinegar, in addition to its flavouring value, also has the power of softening the cellulose of green or undeveloped vegetables and fruits, thus rendering some unpromising substances acceptable as condimental foods.

Vegetables commonly used in pickling are cabbage, tomatoes, cucumber, beets, carrots, beans, cauliflower, onion. Green or unripe fruit and nuts which are tender enough to absorb the vinegar may be used also.

The preliminary preparation of various vegetables differs in some ways. Some are more satisfactory for pickling if first soaked in salted water to extract acrid flavours; others may be lightly sprinkled with dry salt overnight, while some are simply parboiled in salted water. By salting for some hours beforehand in this way, a portion of the water contained in the vegetable is extracted from the tissues, which are then in a condition for ready absorption with the spiced vinegar.

A list of various vegetables and their method for salting before being placed in vinegar is given hereunder:—

Green tomatoes.—Soaked in brine (4 oz. salt to 1 pint water) for two or three days.

Cabbage.—Shredded and sprinkled with salt and left for 24 hours.

Beetroot.—Three-quarters cooked in salted water.

Gherkins.—Packed in salt for two days.

Cucumbers.—Packed in salt for two days.

Cauliflower.—Broken into sprays and either sprinkled with salt overnight or parboiled for five minutes in salted water.

Walnuts.—Soaked in brine (2 lb. salt to 1 gallon water) for one week.

Carrots.—Parboiled in salted water.

Onions.—Soaked in brine (4 oz. salt to 1 pint water) for two or three days.

Beans.—Packed in salt.

All vegetables should be thoroughly rinsed in several changes of fresh cold water before being placed in vinegar.

Metal utensils should be avoided in pickle-making. Porcelain pans are better for the purpose, and wooden stirring rods and packing sticks are advised. Colanders or sieves for draining vegetable from brines are also needed. Clean sterilized glass pickle bottles, or earthenware jars which can be well corked or sealed, are suitable for the purpose of storing the finished product. A good home-made sealing wax is formed by mixing together equal parts of shoemaker's wax and resin. These should be placed in a clean tin placed in a saucepan of hot water, and, when melted, the corked bottles may be dipped into the liquid.

Pickled Onions

Onions should be brined (4 oz. salt to 1 pint water) for several days before pickling them in vinegar. After being removed from the brine, they may be scalded in weak salt water for about five minutes, care being taken not to soften them by over-scalding; they should then be drained for a few moments and covered with a thick damp cloth and allowed to remain until cold, when any shrivelled skin should be carefully removed. Grade for size, pack into bottles or other suitable containers, and cover with strong vinegar, which may be flavoured as desired.

If preferred, the scalding process may be omitted, and the onions pickled in vinegar direct from the brine, but the former method gives a better appearance.

Mixed Pickles

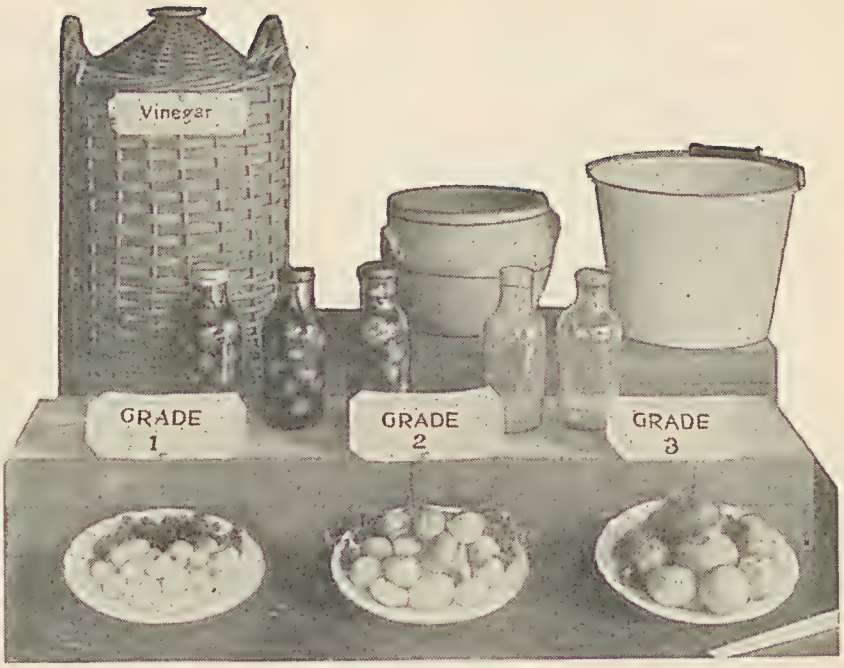
Mixed pickles are a combination of vegetables; those forming the chief ingredients of the mixture may include cauliflower, chillies, white cabbage, small or sliced onion, gherkins, young French beans, melon, or green tomatoes.

The preparation of these vegetables will differ slightly; such vegetables as cabbage are shredded and every alternate layer liberally sprinkled with salt, and a plate or clean board is put on top, and the cabbage allowed to remain for about 36 hours; then the water which the salt has extracted from the cabbage should be thoroughly drained off. The cabbage should be rinsed in several changes of fresh cold water before using with mixed pickles. The final preparation with vinegar and spices is left until they are required for use.

Cauliflower may be broken into small sprays and salted as for cabbage, or the sprays may be blanched in boiling salted water for two or three minutes (care must be taken not to soften the cauliflower unnecessarily), then drained and thoroughly rinsed and covered with vinegar. It is then ready when required for mixing with other vegetables.

Onions are sometimes skinned and allowed to soak in brine for about three to four days, the brine being changed once or oftener if desired. They may then be drained and just scalded (below boiling point); when quite cold, pickling vinegar should be poured over them, and they will be ready for combining with the other vegetables in making mixed pickles.

After the necessary preparation of the various kinds of vegetables, they may be mixed as desired, packed into pickle bottles, which should then be filled with the spiced vinegar prepared in the following manner:—



Grading onions for size.

Ingredients required—

- 2 qrts. vinegar.
- 1 cup sugar.
- 3 oz. peppercorns.
- 3 oz. whole ginger.
- 1 oz. allspice or pimento.
- 1 oz. salt.
- 1 oz. cloves.
- 1 clove of garlic (about ½ teaspoonful when minced).
- 1 tablespoon whole mustard seed.
- ½ teaspoon grated nutmeg.

Bring all to boiling point, then bottle and allow to stand aside for ten to fourteen days to extract flavour; shake the bottle daily, then strain for use.

One method is to simply boil for ten to fifteen minutes and strain for use at once. This is a quicker way, but, where time permits, the first-mentioned method (standing and shaking daily for ten to fourteen days) is preferred.

The sugar may be omitted, if desired, and a little grated onion allowed to take the place of garlic, and two tablespoonsful of grated horseradish may be added to the vinegar.

Mixed Mustard Pickles

Mixed mustard pickles are a favourite with many. The foundation is a mixture of vegetables, such as cauliflower, small onions, celery, green tomatoes, and sections of sliced cucumber, &c. The vegetables, which should be tender, may be cut into convenient shapes and sizes, the onions being peeled, &c. They should all be soaked in strong brine overnight. Next day, drain thoroughly, allow to steep for about twenty minutes in vinegar weakened with water (about equal quantities of vinegar and water), and then bring all to boiling heat in the weak vinegar or in slightly salted water, so that the vegetables may be scalded. Vegetables of a hard nature should be parboiled separately and then added to the rest, so as to prevent some portions of the mixture being hard while others are overdone. After the vegetables have been scalded for about five minutes, they should be well drained on a flat sieve or other convenient article. They are then put into the prepared mustard dressing, heated almost to boiling point, packed into the pickle jars or bottles, and corked and sealed while hot.

Mustard Dressings

There are many different formulas for mustard dressings in common use. The amount of sugar and of other flavouring agents may be adapted to conditions, but excessive flavours should be avoided, as also should a mixture of flavours that do not blend. The

following is a simple mustard dressing suitable for a mixed mustard pickle:—

Ingredients required—

1 qrt. vinegar.
2 oz. ground mustard.
1½ to 2 cups sugar.
4 level tablespoons flour.
2 level teaspoons turmeric.

Celery seed (about half a teaspoonful to a quart of vinegar) is also a pleasant addition to the vinegar for flavouring, and, when used, the crushed seed is scalded in the vinegar and strained out before mixing with the dry ingredients.

Method of Preparation.

Dissolve the sugar in the vinegar by bringing gradually to boiling point; blend all dry ingredients—mustard, flour, turmeric—in a little of the vinegar which has been allowed to cool off for that purpose. When this is mixed to a perfectly smooth paste in the basin, gradually pour it into the scalding vinegar, stirring the mixture until an even smooth paste is obtained, then cook for a few moments; add the prepared vegetables, which have been well drained, and when thoroughly heated through, bottle and cork.

Red Cabbage

Select a firm head of red cabbage, remove the coarse outside leaves, and cut the cabbage into four sections, rejecting the centre stalk and heavy ribs in the leaves. Shred finely, and sprinkle every alternate layer of shredded cabbage liberally with salt, and press down with a clean board or plate; allow to stand for from 24 to 36 hours, then thoroughly drain off the water which the salt has drawn from the cabbage, and place the cabbage loosely in the pickle bottle. It will be of a bluish-purple colour, but will turn red on the application of vinegar and will make an attractive pickle for the table.

The following is a suitable vinegar for red cabbage:—

1 gallon vinegar.
2 oz. whole pepper.
3 oz. allspice.
1 lb. of sugar may be added or omitted, according to taste.

The spices may be suspended in a loose muslin bag while scalding, and afterwards removed.

Scald the vinegar, sugar, and spices, then allow to cool, strain and pour over the cabbage, paddle with a narrow packing stick made of white wood, or half a bamboo cane cut down centre will answer very well for the purpose, it having a groove down the stick when halved. The packing stick may be made to any convenient length for handling. The bottle should not be over filled with cabbage, so that the packing stick can be worked around the contents quickly to displace and remove or send to the surface any air bubbles. The bottles should then be filled right up to the top with the vinegar. The peppercorns may be rejected, or a few divided between the various bottles, which should then be sealed and stored away from the strong light.

Melon Pickle

Prepare the pie melon by paring, seeding, and cutting into small cubes; cover with water to which enough salt for flavouring purposes has been added, then put on to cook. When the melon is almost clear, it should be drained thoroughly. Meanwhile, heat the vinegar and sugar; when boiling, put the drained melon into it and cook for 15 or 20 minutes. the remaining ingredients—mustard, flour, turmeric—should be blended with a little cold vinegar and stirred into the mixture, which is then simmered for about 10 minutes, when the pickle should be bottled, corked, and stored. If desired, 1 lb. of onions may be cooked with the melon.

Ingredients—

6 lb. prepared melon.
¼ lb. green ginger.
1 teaspoon salt.
1 quart vinegar.
1 lb. sugar (white).
2 oz. ground mustard.
2 level tablespoons turmeric.
4 level tablespoons flour.

Green Tomato Pickle

6 lb. green tomatoes.
2 lb. onion (sliced).
¼ lb. mustard.
2 quarts vinegar.
3 oz. whole ginger.
¾ lb. sugar.
1 tablespoon cloves.
2 rounded tablespoons flour.
1 rounded teaspoon turmeric.

Slice the tomatoes and onions, and sprinkle moderately with salt; place a plate on top and allow to remain overnight.

Next day, drain the water which the salt has extracted, and put the vegetables into a preserving pan with the vinegar, sugar, and spices (the latter tied in a muslin bag); simmer together for about 20 minutes, and then remove the spice bag.

Mix the mustard, turmeric, and flour, with a little cold vinegar, and stir it into the pickles; continue the cooking for 10 minutes or so, then bottle while hot.

Pickled Beets

The preparation of beets for pickling is slightly different from that of other vegetables.

Select young deep-coloured beets, wash them, being careful to keep the skins intact. Leave the rootlet, crown, and portion of the leaf stems on during the cooking. Put them into boiling water, and cook until almost done (some prefer to bake them in a moderately hot oven instead of boiling), allow to cool, and slip the skins from the roots. Cut them into slices about ½ inch thick, or into such shape or size as will suit the jars; pour the cold spiced vinegar over them, and cork and store.

Beets may also be combined with horseradish for pickling. The vinegar may be spiced as for mixed pickles, or spiced with the following:—

To 1 qrt. vinegar allow:—

1 tablespoon grated horseradish.
½ oz. peppercorns.
½ oz. allspice.

Another seasoning used for beets is coriander seed. To make the flavoured vinegar for the pickling of beets, the following ingredients may be used:—

1 qt. vinegar.
½ oz. coriander seeds.
1 oz. sugar.
About 8 cloves.

Scald together, allow to stand until cool, then drain and pour over the beets.

Pickled Gherkins

Gherkins and cucumbers are also a favorite vegetable for pickling, and there are several ways in which they may be put up. Perhaps one of the most simple is to rub them well with salt and then pack them in salt for two days, moving them about occasionally. Rinse and drain thoroughly, place in a suitable vessel which has been lined with spinach or vine leaves, the top of the pickle also being covered with the leaves. Now pour over them a scalding solution of weak vinegar (about one part vinegar to three parts water), cool quickly, and allow to stand for a few hours, then pour over them a fresh hot vinegar bath a little stronger (two parts vinegar to two parts water), cool, and leave until next day. Pack into a large-mouthed jar with a few sprigs of thyme, a few bay leaves, peppercorns, a little garlic, and cover them with fresh vinegar which has been brought to boiling heat and allowed to cool, or, if preferred, they may be packed with sweet spiced vinegar.

Pickled Walnuts

Take young tender nuts which can be easily pierced through with a needle. Make a strong brine (about 2 lb. salt to 1 gallon water). Prick the nuts all over with a needle or steel fork and put them into the salt water and leave them for not less than a week; during this time they should be stirred about and a little more salt added to the brine every third day. Then lift the nuts out and spread them in the sun to darken, which usually requires about 24 hours or so. Pack the darkened nuts into jars or pickle bottles and cover them with flavoured vinegar.

Cauliflower

The cauliflower may be put up in a clear spiced vinegar, while it also associates well with a mustard sauce or dressing.

Choose firm, white, close, and even flower heads, dividing into even sprays, and parboil for two to three minutes in slightly salted water. Thoroughly drain these sections, and pack in a good pickle of vinegar and spices to taste, the vinegar and spices being heated together and allowed to cool before pouring over the cauliflower.

Another method sometimes adopted is to sprinkle the sprays of cauliflower with salt and allow them to stand overnight; next day, rinse, drain, and pack in flavoured vinegar.

Another nice pickle is made as follows:—Salt the sprays overnight, then scald in hot vinegar for a moment, drain thoroughly, and heat up in a good mustard sauce slightly sweetened. Bottle while hot, and seal.

Sweet Pickled Carrots

Choose bright-coloured and very young carrots of a good shape. The very young carrots sometimes thinned out of the garden plot may be pickled whole, and make an acceptable sweet pickle. Put them into boiling salted water, and cook gently until three parts done, remove them and dip in cold water, slip the skins by gently rubbing, being careful to keep the carrot nice and smooth. Cut them into even slices, pack tightly like sardines, and pour over them a sweet spiced vinegar, made as follows:—

1 qrt. vinegar.
1½ lb. sugar.
½ oz. cloves.
1 tablespoon cinnamon.
1 teaspoon mace.
1 teaspoon allspice.

Scald together, and strain over the carrots.

Sweet Pickled Cherries

6 lb. cherries.
6 lb. sugar.
1½ cups vinegar.

Stem and stone the cherries, and steam them until the flesh is soft; this will require about 20 minutes; do not allow the fruit to break. Meanwhile, heat the vinegar, add the sugar gradually, and when dissolved add the cherries. Simmer slowly for 15 to 20 minutes, then bottle and seal.

Olives

Care should be taken not to bruise the olives. Grade them, and place in a solution made up as follows to remove bitter taste:—

2 oz. soda lye.
1 oz. salt.
1 oz. lime.
1 gallon water.

Boil the water and allow it to cool again before mixing this solution, and allow it to stand for an hour before using. The olives must be kept submerged (to prevent discoloration).

When the bitterness has left the fruit, pour off the lye, and cover with water which should be renewed morning and night. This washing should be continued so long as the fruit has the peculiar hot taste, due to the presence of lye. When the caustic taste has completely left them, the olives are ready for pickling. Some use brine only, at a strength of 2 oz. salt to 1 gallon water. The brine should be replaced by a salt solution containing 4 oz. salt to 1 gallon water. Two days later, the strength of the solution is again increased to 6 oz. salt to 1 gallon water; then, two days later, 8 oz. to the gallon; two days later again, 10 oz. to the gallon; and finally the brine should contain 14 oz. salt to the gallon. Some prefer to process the olives, at a temperature of 180° for 25 minutes after adding the 8-oz. brine, and they should be made airtight while at that heat.

Help your Neighbour and Help Australia WIN the War

DRYING AND PROCESSING TREE FRUITS—*continued from page 96.*

the results obtainable with moist-pack dried fruits should be sufficiently accurate for practical purposes. The degree of accuracy varies with each variety of fruit. For all dried tree fruits the appropriate American conversion tables, to convert meter readings to per cent. moisture, may be used with sufficient accuracy for packing and control; copies of these tables may be had on application to the Research Station, Merbein. It is hoped to produce conversion tables with a higher degree of accuracy.

Failing the moisture meter, toluene distillation (*) for 2½ hours can be recommended as reasonably satisfactory, if a correction factor be applied. With dried apricots, 2·5 per cent. should be subtracted from the moisture content obtained to give a figure approaching that which would be obtained by vacuum-oven method; with prunes, 1 per cent. should be subtracted.

(*) Methods of Analysis of the Association of Official Agricultural Chemists, 5th Edn., 1940, p. 353.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	Longerenong Agricultural College	Dooen	43
Banyule Stud Pty. Ltd.	Wangaratta ..	42	McNabb and Son, G. A.	Irrewillipe East ..	177
Black, I. S., Estate ..	Mount Noorat ..	52	Northcote Children's Farm	Bacchus Marsh ..	156
Clarke, A. B. ..	Glenormiston South	16			
Dennis, Mrs. A. A. ..	Frankston ..	33			
Dookie Agricultural College	Dookie	77	Onley, W. H. ..	"Glenholme," Caldermeade	50
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Geelong Grammar School	Corio	56	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	29	Powell, T. S. ..	"Carellen," Mansfield	46
Gorman, A. W. ..	"Cathcart," Alexandra	61	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Hollaway, R. W. ..	Caldermeade ..	72	Samuel, Misses G. and E.	Lang Lang ..	48
Kilmany Park Farm Home for Boys	Sale	94	School of Horticulture	Burnley	10
			State Experiment Farm	Rutherglen ..	40
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	State Research Farm	Werribee	229
			Wells, W. G. ..	Caldermeade ..	63

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Andison, J. A. ..	Thomastown ..	43	Child, G. P. ..	Epping	53
Andrew, J. C. ..	Whittlesea ..	121	Christian Bros. ..	Doreen	41
Andrew, W. ..	Whittlesea ..	160	Clark, P. W. ..	Whittlesea ..	62
Andrews, E. H. ..	Templestowe ..	19	Clements, M. and L., and Son	Bundoora ..	135
Balharrie, J. A. ..	Whittlesea North ..	59			
Barclay, A. H. ..	Whittlesea ..	107	Cobain, J.	Thomastown ..	48
Barling, J. ..	Mernda	33	Collins, L.	Doreen	48
Batten, R. J. ..	Wollert	44	Cornfoot, D. H. ..	Whittlesea ..	25
Bebbington, J. ..	Whittlesea ..	92	Cotchin, J. ..	Woodstock ..	18
Benson, R. ..	South Morang ..	35	Coulthard, J. J. ..	Whittlesea ..	66
Bodycoat, A. ..	Wollert	39	Craker, Mrs. E. ..	Warrandyte ..	2
Booth, Mrs. A. ..	Warrandyte ..	8	Cumming, H. R. ..	South Morang ..	23
Bourke, G. J. ..	Fairfield	82	Cunningham, E. C. ..	Templestowe ..	23
Bradbury, A. K. ..	Diamond Creek ..	31	Danaher, J. V. ..	Whittlesea ..	63
Bunting, J. ..	Epping	35	Danns, N. C. ..	Whittlesea ..	34
Butler, W. ..	Wallan	49	Deutscher, H. W. ..	Mernda	168
Callaghan, L. ..	Epping	34	Deveny, M. ..	Bundoora ..	51
Callaghan, T. F. ..	Thomastown ..	40	Draper, L. S. ..	Wollert	31
Carr, W. J. ..	Wollert	65	Drysdale, J. C. ..	Warrandyte ..	41

Name.	Address.	Number in Herd at Last Test.
Fellows Bros.	West Heidelberg	52
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Fox, A.	Mernda	59
French, T. W.	Wollert	43
French, W.	Greenvale	51
Galbraith and Walker	Greensborough	36
Gamble Bros.	Greenvale	156
Gallus, E. A.	Doncaster	14
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	28
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	27
Harding, J. E.	Templestowe	42
Hargreave, Mrs. E. J.	Whittlesea	21
Harkness, H. J.	South Morang	31
Harmer, R. E.	Wollert	38
Hawkes, Miss D.	Warrandyte	21
Hehr, H.	Epping	32
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howden, A.	Epping	29
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	11
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	21
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McDonald, A. J.	Whittlesea	2
McDowell, R. H.	Greensborough	28
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Mason, N.	Donnybrook	52
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	6
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	36
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
Norton, O. G.	Bundoora	37
O'Hern, T.	Epping	58
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Patullo, F. E.	Mickleham	36
Pettit, W. H.	Thomastown	36
Pitson, R. H.	Yarrambat	17
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	49
Rawlings, J. H.	Whittlesea North	41
Righetti, L. A.	Lower Templestowe	40
Rodgers, E.	Whittlesea North	11
Rosewarne, Miss P.	Yan Yean	43
Seeber, B.	Thomastown	24
Shanks, John	Mernda	73
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Simpson, W. G.	Donnybrook	12
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	73
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	31
Southon, H. W.	South Morang	60
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Thomas, Mrs. E.	Broadmeadows	11
Thomas, W. C.	Yan Yean	31
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Vallence, C. A.	Epping	11
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	18
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	33
Williamson, J.	Doncaster (High-street)	4
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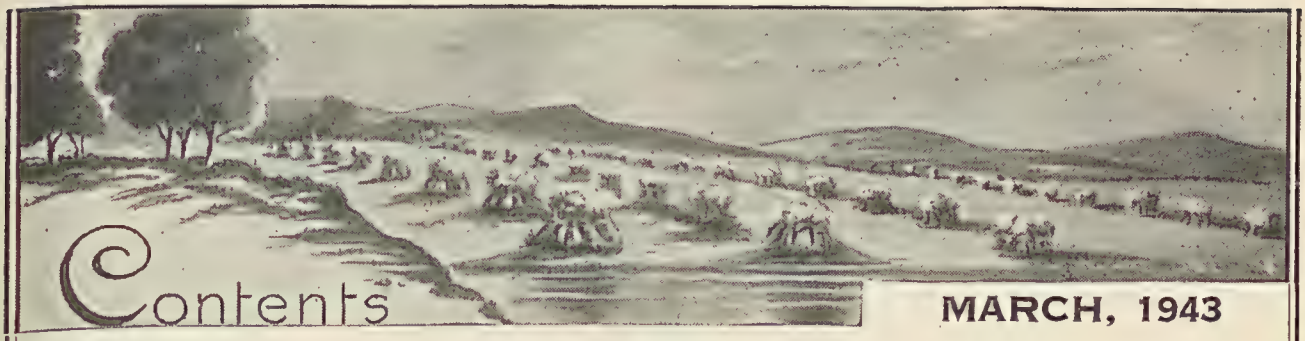
Wilson, J. E.	Diamond Creek	35
Wilson, Mrs. M.	South Morang	14
Wood, A. V.	Yan Yean	125
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Young, Mrs. A.	Wollert	33
Ziebell, H.	Thomastown	32

There are also 447 herds in which 12,918 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.



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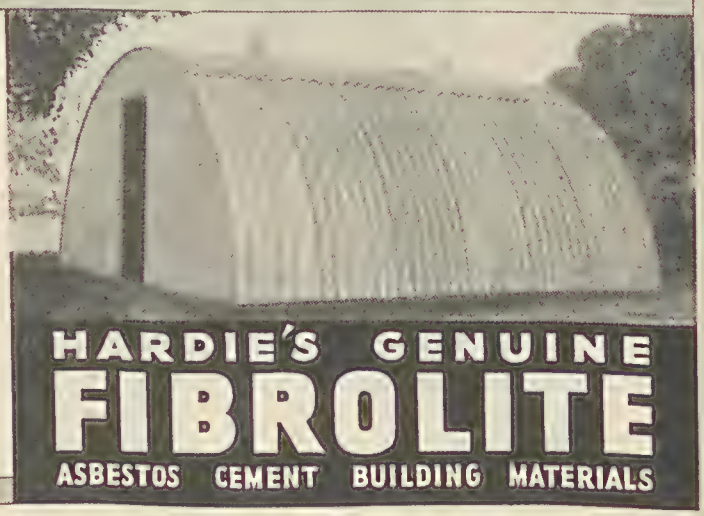

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Pyramid Hill Pasture Competition, 1942

Report by H. HANSLOW, Commissioner, State Rivers and Water Supply Commission, and L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

THE Committee of the Pyramid Hill Agricultural Society is impressed with the need for promoting better irrigation practices in the district and decided to continue the Annual Pasture Competition in 1942 as an effective means to that end.

For this a valuable trophy "The Robert Gregory Shield" is available as a prize and the State Rivers and Water Supply Commssion also contributes to the prize list 14 acre feet of water—seven for the first prize winner and seven for the second.

The inspections in connexion with judging were made in October. Splendid exhibits were presented—their condition may be directly associated with improved methods which are developing in the district. They demonstrated in a striking manner the possibilities of irrigated agriculture there—but the contrast they make with unimproved sections emphasizes also what opportunities Pyramid farmers have lost and will continue to lose unless improved practices become general.

The Pyramid district is one of the old irrigation districts of the State, and the methods on many farms have persisted from times when little was known of the improved irrigation cultural practices which have reached such a high standard in some other parts of Victoria.

The country is plain country with flat grades; shallow depressions are common and drainage is poor. Much of the land is "crabholey". Soils are mainly clay-loams, some heavy textured, but a high proportion of the land, which in its natural state was timbered, is of medium quality and, as the pastures inspected show, all the land is receptive to improvement to a high production standard.

Only partial irrigation is practicable in the Pyramid district. The farms are in relatively big holdings and the district supplied with water on a basis of 1 acre foot of water to every 5 acres commanded and suitable. Where this condition obtains, it follows that dry farming and irrigated culture are mixed. The extent of the water distribution system is so great that supply at frequent intervals is impracticable. This, and the mixed activities on the farms—cereal harvesting, &c., prevent the farmers from giving close attention to irrigated culture as is possible on smaller farms where intensive

culture is practised. These limitations and the traditions arising from the early history of the district explain what may be called the conservatism of many Pyramid farmers.

In the early days of irrigation in the Pyramid district, water supplies were inadequate for any consistent endeavour—water would be available in spring to irrigate cereal crops if required—some would be run into shallow swamps to promote growth of a "green pick" in summer. Progressive farmers grew sorghums or millet and then in autumn would spread any water supplied over natural grass land. These practices were not conducive to good irrigation methods. Land grading was not usual—and the only checkbanking done to direct the flow of water was the erection of huge banks with plough and delver, to form large compartments. At best it was a "hit or miss" method of irrigation and despite the natural flatness of the land there could be no pretence of uniform distribution of water.

There are certain conditions in irrigation which must be observed if it is to be done efficiently and economically and what is of greater importance—if it is to continue without spoiling the land. One basic requirement is regulated distribution to ensure uniform application of water and this means more than wetting all the land; some farmers contrive to do that with big banks at wide intervals, but the water will be up to a foot deep in places and very shallow in other parts. The land is likely to get too much or too little and this is not conducive to uniform growth of crops. The fact that millet and sorghums withstand excess watering is not a warrant for retention of these old methods.

Continued watering in excess will spoil the land, and areas subjected to it will soon become artificial swamps. Rushes and "beauty heads" (yellow weed) will replace the better natural vegetation.

Specimen leaves of subterranean clover from the pasture of Messrs. C. E. Wood and Sons, winners of the competition.

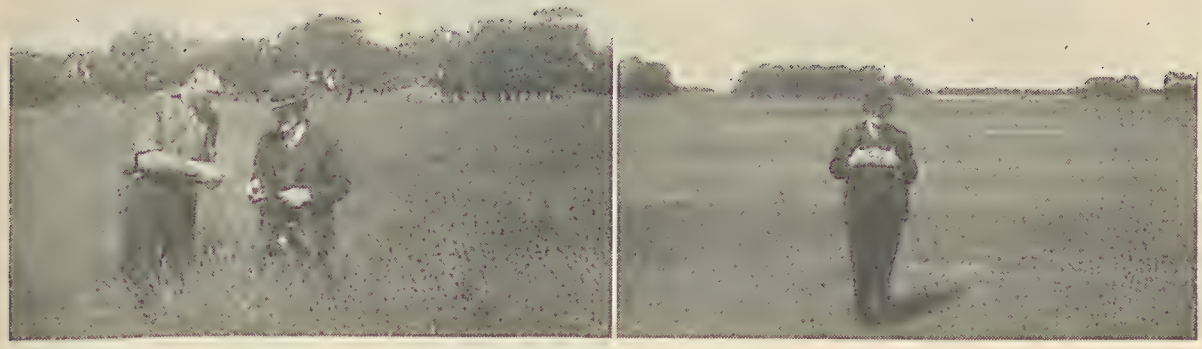
Excess watering implies waste of water and aggravation of drainage troubles. All Pyramid farmers should fall into line and adopt the border system of layout for irrigation. It means the division of the land into bays by banks running down the slope. The land between the banks is levelled from side to side and reduced to plane surfaces along the length. The dimensions of the bays may be varied to suit different conditions. The length is governed by the fall, the amount of water available, and physical condition of the soils, and of course continuity of slope; the width depends mainly on "sidefall".

In general, bays 10 chains long and $\frac{2}{3}$ chain wide are suitable; they ensure good spread and good control. Now the Pyramid farmers in general are slowly discarding their "big" methods, characterized by bays several acres in extent, but they are reluctant to adopt "small dimension" bays and one finds that these run for 20, 30, or 40 chains—but the inevitable poor control of water is an associated feature.

The adoption of good lay-out for irrigation is recommended. Grading and checkbanking are not costly; they represent a permanent improvement to irrigated land and the farmer undertaking them will be recouped over and over again by better production and saving in time and water.

The choice of suitable crops is another most important matter in irrigation farming. For reasons given above, annual summer crops such as millet and sorghums have been common, but permanent crops are desirable for many reasons; they do not involve repeated cultivation and sowings; they are generally associated with makeshift irrigation practice; they are not always soil "improvers". On the other hand, permanent crops typified by lucerne, and mixed pasture can be made productive, economical in management and do not deplete soil fertility if well managed.

The acme of development in irrigated dairying country is represented by the beautiful swards of mixed rye grass, cocksfoot, white clover, and strawberry clover to be seen in some of the closer settlement areas. Such pastures cannot be grown except on very small areas in the Pyramid district, but fortunately, there are other pasture elements, Wimmera rye grass and subterranean clover which offer great possibilities. All the pastures inspected were made up mainly of these two. Pyramid is naturally "trefoil" (burr medick)



Left—The winning exhibit on the property of Messrs. C. E. Wood and Sons. Right—Unimproved land immediately adjoining.

country and its spontaneous development in many places makes a good indicator. All pastures should include clovers or medicks—they are fertility gatherers and soil improvers. Wimmera rye grass and subterranean clover are both winter growers, they require watering only in autumn and spring. They provide a residue of good dry feed in summer, but require a summer growing complement. Wimmera rye grass and subterranean clover are easily established—the land should be laid out to permit proper irrigation, but it is quite good practice in the case of these two elements to sow them under cover of an oat crop and the following rates of sowing are suggested :—

Oats	1 bushel per acre
Wimmera rye grass ..	5 lb. per acre
Subterranean clover (mid-seasonal) or late Tallarook	2 lb. per acre

Lucerne is pre-eminent as a fodder crop. It is favoured by good soil conditions and it will not tolerate excessive wetness. It is drought resistant and will withstand dryness for long periods if irrigation is not possible. It is not grown extensively at Pyramid, but it is safe to say that failures are due more to mismanagement than anything else. There are many areas of good land which would grow it successfully. Autumn sowing on graded land is recommended—5 lb. of seed per acre in a well-prepared seed bed, should ensure a dense establishment.

Sudan grass and millet are both good summer fodders and an area of either or both will fill the gap in the subterranean clover seasons.

The factor in irrigated agriculture which transcends all others is the conservation and building up of fertility and unfortunately at the present time one must speak of this with restraint, because the key to it is the liberal use of superphosphate which is scarce at present. There is striking evidence of its value provided in the Pyramid pasture exhibits. There was a growing appreciation of its value in the district, but at present, one can only exhort farmers to make the best of limited supplies and to determine to exploit its value when full supplies are restored. Two cwt. per acre every year on subterranean clover and other crops gives payable responses.

It may be said definitely that refinements in irrigated agriculture as outlined not only make for economical production but ensure stability and permanence.

The advice given is based on experimental evidence and the experience of the best and most successful farmers. Pyramid provides good object lessons, but there is very great scope for extension of better methods. The competition as conducted should be an effective means of promoting improvement.

First prize was awarded to Messrs. C. E. Wood and Sons for a particularly fine exhibit of 15 acres Wimmera rye grass and subterranean clover. The pasture was sown in 1931 on land graded and checkbanked with bays 15 chains long and 30 yards wide. The Wimmera rye grass was sown at the rate of 7 lb. per acre and the subterranean clover, 4 lb. per acre. They were sown without a cover crop at sowing and every year since, the pasture has been manured with superphosphate at the rate of 1 bag per acre, and two years out of every three the mixture has been mowed for silage or hay. Messrs. Wood and Sons have a total area of 750 acres

and for many years they have adopted pasture improvement methods with very satisfactory results.

Mr. John Wood won second prize. He has a farm of 306 acres divided into 10 paddocks and the whole area has been topdressed. Mr. Wood has used 100 tons of superphosphate in the 6 years he has been in occupancy. His pasture exhibit in the competition was 20 acres in area. Half of this had been sown subterranean clover 2 lb. per acre, and Wimmera rye grass 4 lb. per acre under oats. Half was in lucerne, but the old lucerne area was scarified and Wimmera rye and subterranean clover sown on that too, at the same rate.

In 1938, the whole area was reworked and regraded to fill crab holes which had sunk after the first grading. This pasture paddock is 18 chains across and it is subdivided into 10 bays, 11 chains long.

The topdressing programme on this paddock was as follows:—

1937–38	..	2	cwt.	of super.	per acre.
1938–39	..	$1\frac{3}{4}$	,,	,,	,,
1939–40	..	1	,,	,,	,,
1940–41	..	2	,,	,,	,,
1941–42	..	$1\frac{3}{4}$	,,	,,	,,
1942–43	..	1	,,	,,	,,

A measure of the production resulting is given in the following record.

In 1941, the paddock was grazed until the end of September. 31 tons of hay was cut from it in November and it carried 800 ewes for 14 days after hay cutting.

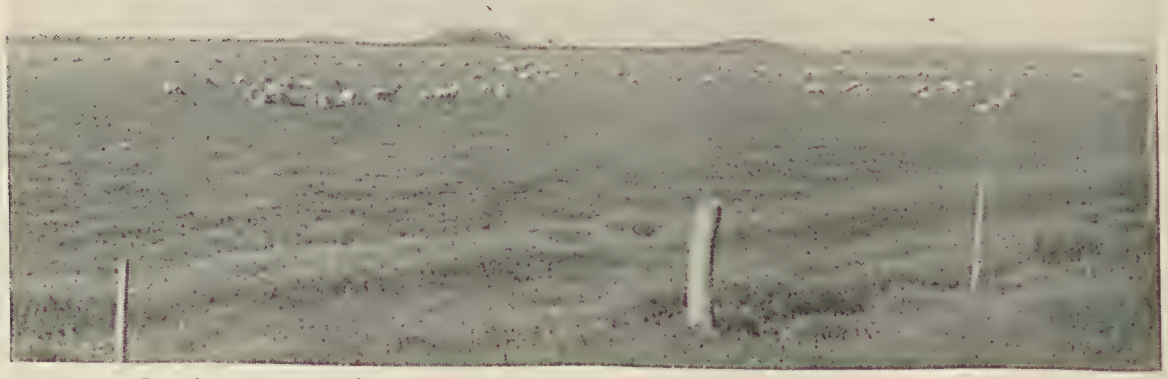
In 1942, late in February, 1 cwt. of super. per acre was applied and the first irrigation was given on March 15th. It was watered again on April 20th.

Between May 10th and 22nd, 227 ewes and 40 wethers grazed the paddock. Between June 6th and 17th, it carried 250 ewes and lambs and between 18th and 26th it had on it 30 ewes and lambs.

Between 26th June, 1942, and 9th July, 1942, 20 ewes and lambs were carried, between 26th July, 1942, and 6th August, 1942, it had 220 ewes and lambs. The third watering was given on October 2nd, and at inspection on October 14th it had a dense growth of most luxuriant grass and clover. As an outcome of improved practice Mr. Wood has for three years lambed down 500 ewes and fattened the lambs. In addition, he is now milking 15 cows and the block is also carrying 8 head of young cattle and 5 horses.

Six years ago, when Mr. J. Wood started on the block, he milked 20 cows, had a few young cattle, and did a little cropping. The obvious improvement in the productive capacity of this block makes it an object lesson to all.

Mr. R. N. Mills, of Mincha, was awarded third prize for an area of 20 acres of subterranean clover and Wimmera rye grass. Except for two patches of rushes it was uniform and in good condition. The composition was mainly subterranean clover with some Wimmera rye, but barley grass and "burr clover" were showing. This pasture had been grazed more or less continuously all through the year.



Greatly increased carrying capacity has resulted from pasture improvement on the property of Mr. J. Wood.

The paddock was laid out on the border system. The width of bays was 45 feet, but they ran for 20 chains and were too long. The pasture was sown in 1940, Wimmera rye grass 6 lb. per acre, subterranean clover 3 lb. with ½ bag of superphosphate and under cover of a wheat crop. This wheat yielded 7 bags per acre. It contained a lot of Wimmera rye grass seed.

In 1941, another 2 lb. of subterranean clover was drilled in and another dressing of super. (½ bag per acre) was applied. The resultant grass crop was cut with the binder, and the yield was estimated to be 3 tons per acre. Cutting was difficult and much undergrowth was left.

A dense bulk of subterranean clover underlies the Wimmera rye grass.

Mr. Mills is known as an enterprising farmer and his successes in pasture improvement ventures have been most satisfactory to himself and should be an encouragement to his neighbours.

PASTURE COMPETITION AWARDS—PYRAMID HILL DISTRICT, 1942.

Name of Competitor.	Layout of Land for Irrigation Conditions of Channels and Drains.	Composition of Pastures.	Condition of Pastures.	Uniformity.	Freedom from Weeds.	Total.
1. Wood, C. E. and Sons ..	19	19	18	19	18	93
2. Wood, J.	19	18	19	18	18	92
3. Mills, R. H. ("B" Exhibit)	17	19	17	18	18	89
4. Malone, L. ("B" Exhibit)	19	16	18	18	17	88
5. Malone, L. ("A" Exhibit)	18	17	18	17	17	87
6. Broad, A. J.	16	18	17	16	18	85
7. Mills, R. H. ("A" Exhibit)	17	17	17	16	18	85
8. Leed, J...	17	18	16	15	17	83
9. Hercus, J.	16	17	17	16	17	83
10. Leed, R. A.	15	17	17	16	17	82
11. Campbell, E. A.	14	16	17	17	16	80

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942 issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
J. L. Fry, Clematis Stud Poultry Farm, 858 Heidelberg-road, Alphington	10.2.43	49
M. A. Jones, Ringwood	22.2.43	352

ESTIMATING A HORSE'S AGE

The Teeth as a Guide

By W. D. SHEW, G.M.V.C., B.V.Sc., Senior Veterinary Officer

AFTER some practice it is possible to judge, fairly accurately, the age of a horse by the appearance of the teeth. This is especially so up to the age of nine years at least.

The teeth of the horse consist of six incisors or front teeth, two canines or tushes, usually absent in mares, and twelve molars or grinders in each jaw.

The Incisor Teeth

The horse possesses three pairs of incisor or front teeth in the upper and in the lower jaw, named respectively—commencing from the mid-point—centrals, laterals, and corners. In estimating the age the incisor teeth of the lower jaw are usually referred to.

Temporary Incisors

Temporary teeth may be distinguished from permanent teeth by the difference in size—they are much smaller and also have a distinct neck between the root and crown. The crown is short and wide, and shell-like in appearance, and is either smooth or slightly fluted. The root or fang is small and flattened. The tables of temporary and permanent incisors both possess a depression called the cup, mark, or infundibulum. This is much shallower in the temporary than in the permanent teeth. It is always surrounded by a ring of enamel.

At birth or within 10 days the foal possesses in each jaw the central incisors. These are followed by the laterals at from 4 to 6 weeks old (Fig. 1) and by the corners from 6 to 9 months old. Thus at 1 year old all the temporary incisors are present, the centrals show a little wear, the posterior margin of the table being level with the anterior margin, while the corner teeth are still sharp and shell-like (Fig. 2).

At 2 years all the incisor teeth show wear; the infundibulum has disappeared from the centrals and laterals and sometimes from the corners. The teeth are a little wider apart at their necks on account of the gradual widening of the jaw with age (Fig. 3).

Permanent Incisors

The permanent teeth may be distinguished from the temporary incisors by being larger, broader, and more solid-looking, less shelly, and the neck is not well marked. They possess distinct vertical grooves down the front and are usually discoloured or dirty-looking.

At 2½ years or thereabouts the central temporary incisors are shed. The permanent ones then make their appearance, and are level with the other teeth at 3 years old. Thus, at 3 years old a horse possesses two large central permanent teeth and four milk-teeth in each jaw (Fig. 4).

At about 3½ years the lateral milk-teeth are shed and are replaced by the permanent incisors, which become level with the centrals at 4 years old. At this age a horse thus possesses four large incisor teeth and two small milk-teeth in each jaw (Figs. 5 & 5A).

At 4½ years the corner milk-teeth are shed and the permanent ones appear, being well up at 5 years old but still sharp and shell-like. Thus, at 5 years old the horse possesses a full mouth of six permanent incisor teeth in each jaw (Fig. 6).

At 6 years the cup or infundibulum has usually disappeared by wear from the lower central incisors, but an enamel spot or star may persist for one or two years longer. The sharp edge has disappeared from the corner incisor, forming a table.

After 6 years thoroughbred horses are usually called "aged," and although there are certain data which assist one in estimating the age after that period one can be much less positive on the point (Fig. 7).

At 7 years the infundibulum has disappeared from the centrals and laterals, though a trace of the enamel may persist, and at this age or earlier a small projection called the hook can usually be observed at the posterior corner of the upper corner teeth. This is due to the fact that the lower corner incisor table does not completely oppose the table of the upper corner tooth at this time (Fig. 8).

At 8 years the infundibulum has disappeared from all the lower incisor teeth, and generally the hook has worn away from the upper corner tooth (Fig. 9).

The upper incisor teeth, with the exception of the corners are rarely referred to, but it may be mentioned that as a rule the upper temporary teeth are shed a little sooner than those of the

FIG. 1.—*Foal*

FIG. 2.—*One Year*

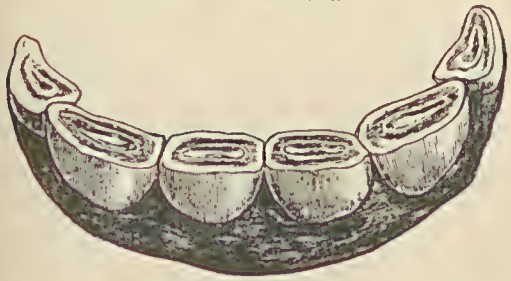


FIG. 3.—*Two Years*

FIG. 4.—*Three Years*

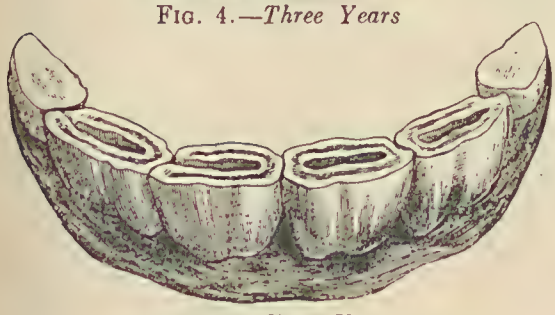


FIG. 5.—*Four Years*

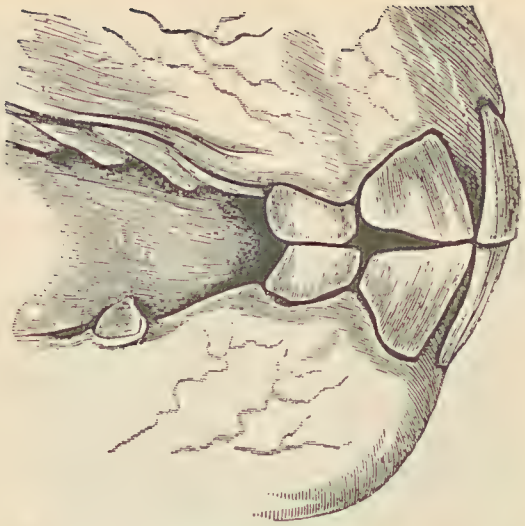


FIG. 5A.—*Closed*

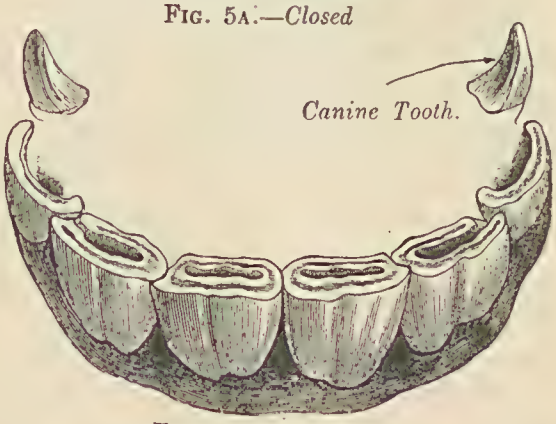


FIG. 6.—*Five Years*

FIG. 7.—*Six Years*

Diagrams of incisor teeth showing appearance at different ages.

lower jaw, and moreover the infundibulum is deeper and consequently persists about two years longer than in the opposing lower incisors.

SECONDARY MARK, DENTAL STAR, OR FANG HOLE.

As the result of the wearing away of the crown of the incisor teeth, a trace of the pulp cavity sooner or later makes its appearance. This is indicated by a slight discoloration or mark a little nearer the front of the tooth than the position of the infundibulum. This is called the star or secondary mark. It generally appears in the central teeth lower jaw at 8 years and in

FIG. 8.—*Seven Years*

FIG. 9.—*Eight Years*

FIG. 10.—*Nine Years*

FIG. 11.—*Ten Years*

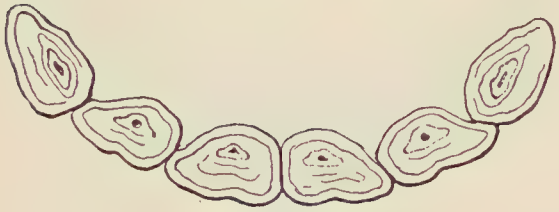


FIG. 12.—*Eleven Years*

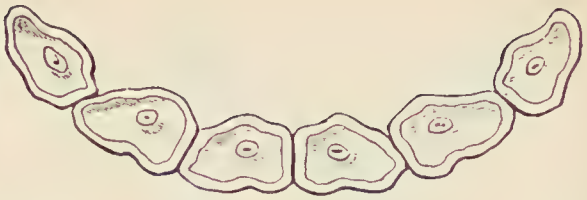


FIG. 13.—*Twelve Years*

FIG. 14.—*Sixteen Years*

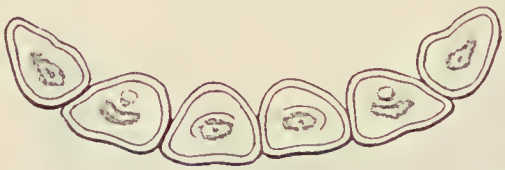


FIG. 15.—*Twenty Years*

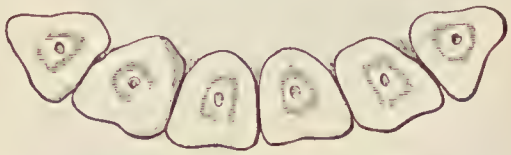


FIG. 16.—*Twenty-Four Years*

FIG. 17.—*Extreme Age*

FIG. 18.—*Extreme Age*

Tables of incisor teeth in lower jaw as they appear at various ages.

the laterals at 9 years. It is readily distinguished from the infundibulum by the absence of the enamel ring.

As age advances changes also take place in the shape of the tables of the incisor teeth. At first they are very much wider from side to side than from front to back. They subsequently become more or less triangular in outline—a change that is observed in the centrals at 9 years (Fig. 10) in the laterals at 10 (Fig. 11), and in the corners about 11 years (Fig. 12). Later the tables become almost round (Figs. 13 to 18), and in very old horses they are often wider from front to back than from side to side (Figs. 16 to 18).

"PINK EYE" OF SHEEP

By W. M. LEREW, G.M.V.C., Veterinary Officer

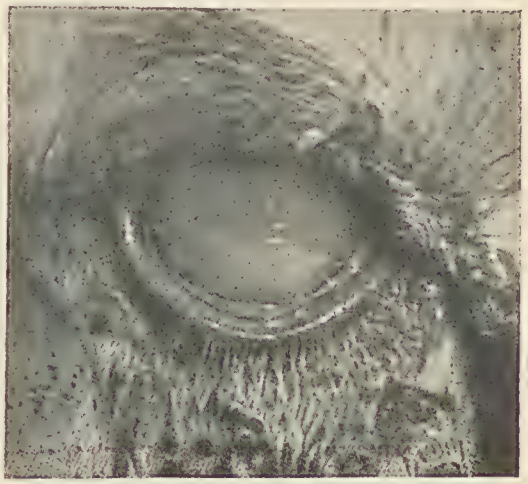
CONTAGIOUS Ophthalmia is a common and, at present, fairly prevalent disease of stock. The disease occurs among all classes of stock but is most common in sheep and it is known to most sheep-owners as "pink-eye".

As the name indicates, Contagious Ophthalmia is a highly contagious disease and one that causes considerable loss among flocks in Australia especially during the spring, summer, and autumn months when flies are about in large numbers. Although the disease is not fatal it causes such pain and discomfort to the sheep that feeding is interfered with and a rapid loss of condition follows. Furthermore, treatment of affected animals takes up much time where a large number have to be attended to and, at present, when there is such a scarcity of manpower, this becomes a serious matter.

The term "pink-eye" is derived from the fact that, shortly after the onset of the disease, blood vessels appear on the surface of the eye giving the eyeball a bloodshot appearance.

The first symptom usually noticed is a slight watery discharge from the inner corner of the eye running down the cheek. A similar discharge from the nostrils is often present. The disease itself starts with the inflammation of the conjunctiva or outer membrane covering the eyeball, and about 24 hours later a film begins to form over the eye. The film always spreads from the upper margin of the eye and may cover the whole front of the eyeball. Later, blood vessels show through this film which is white in colour. Sometimes spontaneous recovery takes place in a few days before the eye has become opaque. If the opacity is complete the animal becomes blind and the surface of the eye may be severely ulcerated.

This blindness may last from about four days to four weeks according to the severity of the attack. Although one eye becomes affected first, the other eye invariably becomes affected within a few days. All breeds and sheep of all ages are susceptible, but young lambs as a rule are not affected as badly as older sheep, especially weaners.



Eye of an affected sheep showing early ulceration. Note the accumulated dry discharge below the eye.

The cause of the disease is believed to be an organism known as *Rickettsia Conjunctivae*. This organism may persist in the eye for several months, the affected animal thus becoming a carrier of the disease.

It is generally considered that the disease is transmitted from one sheep to another by means of flies, as it is much less prevalent in winter and spreads very rapidly when flies are plentiful. This refers specially to sheep in the paddock, but when the animals are closely yarded, there is also the likelihood of the infectious nasal discharge being sprayed by the affected animals breath into the eyes of adjacent sheep.

Up to the present, no reliable line of treatment has been discovered, but a considerable degree of relief can be afforded by the use of a lotion made as follows:—

Sulphate of zinc	..	1 heaped teaspoon
Boracic acid	..	2 " "
Boiling water	..	1 pint

Dissolve the zinc and boracic in the boiling water, allow to cool and then by means of an eye dropper instil a few drops of the lotion into the eye. This should be done two or three times daily. All affected sheep should be collected together and kept in the shearing shed during the day and allowed out to graze in an adjoining

paddock at night. Blind sheep should be hand fed in the shed. The affected sheep are thus handy for treatment and the eyes are protected from the direct sunlight.

In mild cases, recovery commences in about four days and may be complete about a week later, but in severe cases the condition may continue for several weeks. Although complete blindness may occur this will probably be only temporary. The film over the eye will gradually clear up and very often the ulcers will heal up without leaving a scar.

As previously mentioned, other classes of domestic animals, especially cattle, may be affected by the disease and in their case, treatment should be on the same general lines as for sheep

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Pietsch, R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark," Nhill	Spiers, Albert	Bamawm Extension
Fairchild and Clutterbuck	Tinamba	State Experiment Farm ..	Rutherglen
Geddes, L. D.	Bungaree	Sutherland, R. N. ..	Nullawill
Hamblin, A. T., & Sons..	Toolleen	Trenery and Soderlund ..	"Promview," Foster
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, A. J.	Bungaree
		Trigg, N. H.	Bullarook
Hawtin, I. E. and F. ..	"Rossmoyne," Colac	Tweddle, J. T.	"Winlaton," Shepparton
Haywood, Dr. A. R. ..	Hastings	Walch, M. U.	Baring

Milk Utensils as Sources of Bacterial Infection

If bacteria were large enough to be visible to the naked eye and still retained their remarkable powers of multiplication, their increase in an unsterilized milk utensil on a warm day would produce an effect like an explosion. Under favourable conditions, the increase in numbers in 24 hours even on the walls of empty cans, buckets, &c., is almost beyond belief. These large numbers of micro-organisms hasten the souring of milk or cream. To prevent loss by spoilage and ensure a wholesome product, it is necessary to give attention to the sterilization of milk utensils. Mere washing and rinsing will not suffice, especially if several utensils are washed and rinsed in the same water, as several millions of germs usually will be left on the walls of the utensils. Nothing short of boiling temperature will give the necessary sterilization. A well sterilized utensil would not contain more than one organism to each cubic centimetre. It is not difficult to understand what an advantage such a utensil would have over one containing 100,000 or more organisms per cubic centimetre.

Rochester District Young Farmers' Clubs

Pasture Plots Competition for Dunstone Shield

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

Pasture plots at the Ballendella School, winner of the competition.

INSPECTION of the pasture plots at schools in the Rochester district entered in a recent competition for the Dunstone Shield, held under the auspices of the Victorian Young Farmers' Clubs Association, was made on 3rd November, 1942, by Mr. A. Hedley Jones, a supervisor of the Association, and the writer.

Although the entries were reduced mainly because of staff changes brought about by the war, the four exhibits were of a high standard, and answers made by the children to the examiners' questions showed that they have a good general knowledge of grasses and clovers.

Irrigated pastures are a feature of the Rochester irrigation district. This represents a development which has progressed rapidly during the last few years. The standard of most of the pastures seen reflects a good knowledge of the factors governing the establishment and management of mixed grasses and clovers under irrigation, and this is very different from the conditions obtaining a few years ago when comparatively few farmers appreciated the value of pastures, and not many knew the standard species or knew the importance of adequate watering, liberal manuring, and good grazing management.

The value of mixed pastures for irrigation conditions in Victoria was established many years ago at the State Research Farm, Werribee.

Lucerne was the basic crop in the development of the closer settlement areas. It should always remain an important crop because of many valuable qualities: its productivity, its longevity under good management, its value as a fodder, its soil renovating power, and its drought resistance and consequent ability to withstand dryness. But it has its limitations and, by comparison with lucerne, mixed pastures, given regular attention, are truly perennial. They are very productive and present variety of feed to stock: They are very nutritious, they are flexible and are adapted to

Some pupils of the Nanneella West School, and their pasture plots. This school came second in the competition.

by donating a liberal prize for the best managed plot and for the best records of work and observations concerning them.

The Young Farmers' Clubs Association fosters the movement and indeed has encouraged the establishment of pasture plots in all districts.

Mr. W. Dunstone, M.L.A., in recognition of the value of the projects, has donated a valuable shield for competition.

Basically, the value of pasture plots in schools lies in the opportunity provided for correlation of school work with realities. They have a direct practical advantage but they also provide means for exercises in arithmetic—for observation and recording—for drawing, graphing, and composition. Pasture plants, in their development, present subjects for absorbing studies in natural history.

many and varied soil conditions, and they will grow in situations unsuitable for best growth of lucerne—on heavy and wet soils for example. They are well adapted to grazing—this implies low harvesting costs, and will withstand abuses in grazing and are not damaged by occasional flooding for prolonged periods.

Eighteen years ago, irrigated pastures were a novelty at Rochester. Guided by the experience at the State Research Farm, Werribee, officers of the Department of Agriculture proclaimed their value, but knowledge about irrigated pastures penetrated the minds of farmers slowly at first.

The pasture plots of the Young Farmers' Clubs and schools in the Rochester district were important agencies in accelerating the spread of knowledge concerning pastures. The young farmers make intensive studies of the standard species of grasses and clovers. They interest their parents and associates in similar studies and when they assume the responsibilities of farm management, as many of them have, they apply the lessons they have learnt.

It is an interesting fact that the pasture plots as they are at present conducted were inaugurated in the Ballendella and Nanneella West schools, and many will recall the enthusiasm with which the late Mr. John Roy, of the Closer Settlement Branch of the Water Commission, fostered the move. He presented seed and manure to sow the plots; he obtained timber to enclose each 6 ft. x 3 ft. plot; and he stimulated interest in the project at each school

Record books this year, which formed the basis of one set of points, were progressive with the work of last year. Drawings, pressed specimens of the grasses and clovers in the plots as well as the weeds of the district, and valuable notes thereon, revealed the keen interest of the scholars. Each set of books was different, and all showed thoroughness. The excellence of the graph work at Nanneella West school was outstanding.

The Rochester Agricultural Society has always supported this movement—as complementary to its own efforts in regard to competitions and field days and, as President of the Society, Mr. Bickley accompanied the judges.

Details of the awards to the two leading schools are shown hereunder:—

School.	Plots. (30).	General Knowledge. (40).	Record Books. (30).	Total. (100).
1. Ballendella ..	29	33	23	85
2. Nanneella West	28	28	25	81

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Dairy Cattle

THE future of dairying is linked with herd improvement. Every avenue open to farmers to improve their cattle should be explored and utilized to the utmost. The herd should not be allowed to deteriorate because of abnormal war conditions. After the war an unprecedented demand for good dairy cows is likely from men leaving the services to take up dairy farming, and, in the struggle to make a living, established dairy farmers will require better and more profitable dairy cows.

Many herd-testers have left their work to join the services or seek more remunerative employment. To-day only about one-fifth of the pre-war herd-testing staff remains. Consequently it is possible to test only one-fifth of the number of cows tested two or three years ago, and the number is likely to decrease further. Herd-testing is the yardstick for measuring the productive efficiency of individual cows and the breeding worth of bulls.

Those farmers still able to test their herds are fortunate and should take every advantage of the opportunity to improve their herds to the utmost by sound breeding, judicious culling, good calf rearing, and better feeding, not only to build up a reputation for themselves, but to produce desirable bulls with high productive ability to sell to other breeders or dairymen who are unable to test.

The use of good bulls is more essential than ever before, because of the fact that so many dairymen, who were guided by herd-testing in the progressive improvement of their herds, will be working in the dark.

Without herd-testing, the farmer must revert to less reliable means of measuring his cows' production. The butterfat returns from the factory will give a reliable figure for the herd average, but the efficiency of the separator should be checked. If the herd average is maintained or improved, all will be well. If not, it should be quickly decided whether the fall is due to war-time factors, e.g., superphosphate rationing. Falls in production due to other factors under the control of the farmers should be corrected immediately. Unthrifty cows should be replaced by new heifers and bulls believed to be siring low-producing daughters should give way to proven bulls or bulls from known high-producing strains.

Without herd-testing there will be much doubt when culling cows, and with milking machines it is not always possible to estimate even the quantity of milk individual cows are producing. Therefore, periodical weighing

of each cow's milk will enable a check to be made on individual yields and by comparing these yields, the culls can be more accurately determined.

Beef Cattle

Indications are that the production goal of 107,000 tons of beef and veal set for Victoria this year is likely to be exceeded. This quantity of beef and veal is being produced despite shortages of superphosphate for top-dressing, shortages of labour, transport difficulties, and many other hitches due to the war, and it is very encouraging to see production so high. There is one very gloomy feature, however, and that is the big increase in the number of cows being slaughtered. It is the big increase in cow beef that is balancing a big decrease in ox beef and slight decreases in young beef and veal.

The increase in cow beef is believed to be due to dairy farmers reducing their herds. If the carrying capacity of farms is decreasing, due to superphosphate rationing, the increased slaughterings of cows cannot be avoided, but if dairy farmers are reducing their herds on account of labour shortage and either leaving the farms under-stocked or re-stocking with sheep, the increased slaughtering of cows is deplorable. Under these conditions the cows should be retained and mated to beef bred bulls for rearing vealers or beef cattle.

At the present time beef production offers a very good return and will be found quite as profitable as sheep in the dairying districts under existing conditions, as beef cattle require less labour than sheep. Furthermore, any dairy farmer adopting such a procedure will have the nucleus of a dairy herd when conditions return to normal.

Beef and veal production has now been placed in the very highest priority and should be encouraged to the utmost. There will be no difficulty in handling any surplus above the production goal figure.

Markets should remain good right through to the next lamb season, and fatteners should now hold their stock in the best condition until sold.

Bees

Where an autumn flow of honey and pollen is present, it is advantageous to carry out queen replacement, although preparations should have been made in February.

Queen mothers should be chosen from the best colonies having good honey gathering qualities, gentleness, and long-lived workers of even markings and large structure.

The queen mother should be large, agile, and of good depth from the top of the back to the bottom of the abdomen.

Colonies to be used for queen rearing should be populous, having bees of all ages.

To secure best results in rearing queens, feeding should be resorted to irrespective of a honey flow as a break in the weather or a break in the secretion of honey is detrimental to good results.

To create ideal conditions a diluted mixture of six parts of water and one of honey should be fed to the colony in an inverted feeder. Pollen should be plentiful.

For those not familiar with the Doolittle or grafting method, a good method is to make the strong colony queenless, remove the brood and replace with brood from the breeder, cutting along the bottom of the combs where young larvae and eggs are numerous. The queenless bees will start making many queen cells on the prepared combs.

The feeders should be kept full and in ten to eleven days the cells will be mature and can be cut out and used where required. When handling these cells great care must be exercised.

With the grafting method, all brood should be removed a few hours after the colony has been made queenless and the graft given.

A 15-lb. cluster of bees which has been feeding and maintaining its normal area of brood will draw to completion and perfect up to 60 queen cells.

Some colonies are better adapted to queen raising than others. Such colonies can be found by testing and experience.

Colonies that are to be divided up to make the nuclei should be fed about ten days before receiving the mature queen cells and feeding continued until the young queens are laying.

Brood rearing must be stimulated by feeding to make ideal conditions for successful queen rearing. Start feeding all colonies under manipulation, including the queen mother colonies, the cell raisers, the colonies to be divided into nuclei and the nuclei themselves at least ten days prior to operations.

[W. A. Collins, Apiary Inspector.]

Four views of the piggery described hereunder.

A Well-constructed Piggery

Illustrated on this page is a piggery, recently constructed on the property of Mr. Harry Klemm, Londrigan, North-eastern Victoria.

The first picture gives a general view of the five pens the back half of which is roofed. The pipe in the foreground is used for the delivery of separated milk from the dairy to the piggery. To the right a shallow, open concrete drain is shown leading from the piggery.

The second picture shows one of the pens holding a fine line of baconers. The hollow concrete brick construction of the walls can be seen. The same type of bricks was used for the floor of the sleeping section where the pigs are standing. This floor has a 3-in. step up from the feeding section in front of the pen and as the whole floor is built up above ground level, excessive dampness is avoided in the sleeping quarters.

An important feature of each pen is the dunging passage as seen to the right of the picture. The passage is 4 ft. wide and partitioned off from the sleeping section by a wall 3 ft. high. The pigs use this passage, with the result that the remainder of the pen is kept clean and the work of cleaning the pens is reduced.

The third illustration shows the passage in front of the pens in which feeding and drafting are carried out. Drainage from each pen runs into the drain to the right-hand side of the passage. The enclosure to the right is used to store milk and meal containers and as a place to prepare the food.

The concrete troughs are fixtures at the front of the pens with the front fences coming down over them to allow food to be poured in from the outside. The pigs in this picture are being moved along the passage to the drafting and loading yard shown in Illustration No. 4.

The last-mentioned picture shows the drafting yard at the end on the pens and passage, with the loading race adjoining. This yard can also be used for feeding pigs kept in adjoining paddocks. A dung pit constructed of concrete bricks is shown to the right.

[L. A. Downey, H.D.A., Pig Expert.]

Sheep

Crutching has many advantages. It is a most important factor in the control of blow-fly troubles. Crutched sheep have more freedom of movement. It prevents the staining of an undue quantity of wool. Crutched ewes lamb more easily. The lambs are enabled to feed more freely and the udder and teats are kept cleaner.

About this time of year all sheep should be crutched and wherever necessary wigging and ringing should be performed at the same time.

The wool should be shorn from between the hind legs and up behind and well over the tail to remove all stained wool or wool likely to be stained later in the season. With pregnant ewes, wool round the udder should also be removed. The wool should be sloped off between the closely shorn parts and the uncut wool so that the long wool does not hang over to harbour moisture and dirt which may attract flies.

Ewes heavy in lamb should be handled very carefully. In the first place they should be driven quietly and not forced through gateways. They should be "walked" from the pens to the crutching board. They should be sat down gently. The shearer should not press on them too heavily during crutching.

Poultry

The Thirty-Second Burnley Egg Laying Competition commences on 1st April next, and will continue for 48 weeks. If a bird is likely to break the previous record, however, it will be retained for a full twelve months (365 days). At the present time the twelve months' record for this competition is 340 first-grade eggs laid by an Australorp during 1940–41.

This year the "Single Test" only will be conducted, and intending competitors should make application immediately to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

Competitors are advised to select the best pullets bred from strong robust parents that have not suffered an illness of any description. It is only those birds bred with a high degree of constitutional vigour that can produce progeny which stand the strain of high egg production over a long period.

Breeders should remember also, that visitors to the competition will judge the birds they see there as representative of the flocks they have been chosen from. Therefore care should be taken to see that only birds of the best quality, as judged by appearance, are selected.

There are certain outward features which are helpful in determining a bird's ability to lay a large number of eggs, but these are not always reliable. If they were, testing would be unnecessary. A most important consideration is that they should be bred from a proved strain. The birds entered must be typical of the breed, and free from external faults, such as crooked breasts, side-sprigs, &c.

[H. F. Clinton, Poultry Expert.]

Fertilizer Registrations and Unit Values for 1943

The fixed prices for animal fertilizers have now been issued by the Prices Commissioner, but the Regulation authorizing the prices was not gazetted in time to allow publication of the annual list of registrations and the unit values for 1943 in the March issue of this Journal. It is expected however, that the list will appear in the April issue of the Journal.

Help your Neighbour and Be Helped by your Neighbour

PULLORUM DISEASE

By HAROLD E. ALBISTON, D.V.Sc.,
Director, Veterinary Research Institute,
University of Melbourne . . . . .

TO POULTRY KEEPERS.

The Department of Agriculture is anxious to help all owners whose stock may be affected by disease. Unfortunately some poultry keepers appear to be disinclined to report cases of notifiable diseases proclaimed under the Stock Diseases Act, apparently because they fear their operations may be hampered by unnecessary restrictions. This attitude is not justified, as any action taken has as its immediate object the benefit of the individual as well as the industry. Where such outbreaks have been reported promptly to the Chief Veterinary Inspector, the advice given frequently has enabled the owner to avoid the heavy economic loss that would have been incurred had the disease not been speedily diagnosed and properly treated.

Poultry farmers who are experiencing sickness or mortality in their flocks should send a live, sick bird to the Veterinary Research Institute, Story-street, Parkville, N.2, where a diagnosis will be made free of charge. In addition, a letter should be forwarded to the Director of the Institute notifying him of the despatch of the bird and setting out the history of the case.

PULLORUM Disease, is the most insidious and destructive of all known diseases of poultry. It has been present in Victoria for a number of years, and is becoming more common as the poultry industry develops.

Pullorum disease is a specific infectious disease of birds, caused by a micro-organism or germ, the *Salmonella pullorum*. This is a slender rod-shaped form, allied to those bacteria known as the paratyphoid group, and it is usually found in large numbers in the blood and organs of chickens dying from the infection.

Although pullorum disease produces the most marked results in young chickens, occasionally it may cause sickness and death among adult fowls. Other birds are rarely affected, although baby turkeys are very susceptible, and cases are on record of high death rates in turkeys hatched in infected incubators. Ducks are very resistant to infection.

Source of Infection

The course of pullorum disease may be very aptly termed a vicious cycle. It is one of the very few diseases which are actually hereditary, as the causal organism may be present in eggs laid by infected hens. In describing the course of pullorum disease, it is convenient to commence with an infected fertile egg which hatches. The chicken hatching from this egg may have contracted the disease already, but it almost certainly will show a heavy contamination of its down with the germ. As the chick dries in the incubator, small particles of infected down will be found in the air, thus providing the infective material by which its fellows are exposed to infection by inhalation. This point has been adequately proved experimentally, by the placing of artificially-infected down in incubators, resulting in infection of the contained chicks.

It has also been proved, experimentally, that the hatching of a few infected chickens in an incubator is sufficient to infect healthy chickens hatched in the same incubator. Once the infection commences, the ingestion of infected material is also a means of dissemination from chick to chick.

Thus an outbreak of pullorum disease in chickens generally starts in the incubator. Although the disease has a high mortality rate, the fact that some chickens survive is mainly responsible for its perpetuation, for recovered fowls usually show a chronic infection of the ovary, and are liable to lay infected eggs; that is, they become the "carriers." The inclusion of only a few infected eggs in an incubator is sufficient to produce an outbreak of the disease.

Further, unless adequate precautions are undertaken, succeeding hatches may contract the disease, even in the absence of infected eggs, through the contaminated incubators or brooders. The system of custom hatching may thus be responsible for the contamination of otherwise clean stock.

A considerable amount of investigation has been directed to the determination of the egg-laying capacities of "carrier" hens, including

their fertility and hatchability. In general, it may be stated that 2 per cent. of eggs from an infected hen usually hatch into infected chicks. Other eggs may prove fertile, but do not hatch, and a large percentage are unfertile. Although this figure may appear small, yet the highly infectious nature of the disease, especially under modern conditions of poultry keeping, makes it quite a formidable one.

Distribution.—The disease is world-wide in its distribution, and occasions severe losses in all poultry-raising districts. For convenience, the disease will be described in two sections—(1) in young chickens; and (2) in adult fowls.

Chickens

With the development of artificial incubation of fowls' eggs, pullorum disease has become more important. Like other poultry diseases, it owes its formidable nature to the intensive system of poultry keeping. It does occur, however, with hen-hatched chicks, although not nearly to the same extent nor as seriously.

Mortality Rate.—This is estimated at between 40 per cent. and 90 per cent. The average is 75 per cent., although we have known small batches of chickens to be completely destroyed.

Symptoms

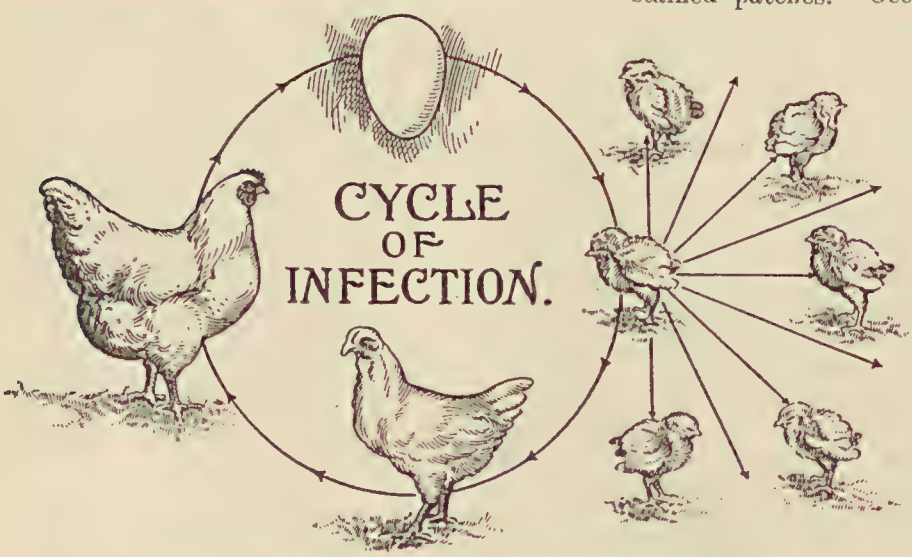
In the absence of obvious faults in the system of incubation or general management, the appearance of a fatal disease within a few days, or even a week or two, after hatching, should be viewed with grave suspicion. As a rule, the deaths from pullorum disease start gradually, but rapidly reach a peak four to seven days after hatching. The affected chickens usually appear dull and drowsy, separate themselves from their fellows, are ruffled with drooping wings, and show a general absence of the liveliness and chirpiness which characterize healthy chicks.

Death may ensue rapidly after symptoms are first noticed, or the affected chicks may show a general weakness, staggering walk, distended abdomen, absence of appetite, and in a number of cases, a soft frothy yellowish-white diarrhoea which may paste up the vent and so hinder the passage of subsequent motions. This symptom gave rise to the name Bacillary White Diarrhoea, by which pullorum disease was formerly known. The fact that it is not always present, and that other conditions may be accompanied by a whitish diarrhoea, has led to the adoption of the term, pullorum disease.

After the seventh day, the death rate gradually declines, and if any survivors are left, they may be reared apparently successfully, although some may remain stunted for a time.

Post-mortem Findings.—In a number of chicks dying from this disease it is impossible to find any lesions, and the presence of the disease is only substantiated by bacteriological methods. In about 60 per cent. of all affected chickens, however, definite lesions are discoverable in the lungs. These lesions consist of small yellowish or greyish cheesy nodules in one or both lungs, which may be so numerous as to coalesce, so that little normal lung tissue remains.

Similarly, cheesy nodules may be found in the heart muscle, gizzard, and in the wall of the large intestine, and the contents of the caeca may also be cheesy. The liver is usually enlarged, and may show haemorrhagic or blood-stained patches. Occasionally, the lung lesions may take the form of a general pneumonia, without the localization of the infection in small abscesses.



Showing the cycle of infection in pullorum disease.

Differential Diagnosis

In actual practice, it is necessary to differentiate pullorum disease from aspergillosis and coccidiosis. Aspergillosis was formerly thought to be a common disease of young chickens, characterized by nodules in the lung, and mouldy growths in the air sacs. We have seen only one or two cases of aspergillosis

in this laboratory during the past fourteen years. Aspergillosis is, in fact, a rare disease of chicks, and its diagnosis is readily made by bacteriological examination of lesions.

Coccidiosis, although usually a disease of older chicks, may occur in very young chickens. We have found, on a number of occasions, both coccidiosis and pullorum disease in chicks just over a week old. The differentiation between these two diseases is possible only by expert laboratory examination.

Chickens affected with pullorum disease or bacillary white diarrhoea.
[U.S.D.A.

Adult Fowls

Chronic Form.—In adults, the infection tends to be localized in the ovary, which may contain both normal and abnormal ova. The normal ova are like those of a healthy bird, although the germ of pullorum disease may be present in them. The diseased ova, however, are misshapen, shrunken, and angular, with discoloured contents. The yolk material is changed to a dark-brown, greenish or black colour, and is frequently tough in consistence. Occasionally, affected ova may be cystic with dark fluid contents. Small sac-like structures with solid or semi-solid contents may be found in the abdominal cavity. Occasionally, as the result of the rupture of a diseased ovum, peritonitis may develop. As a general rule, however, fowls with a chronic ovarian infection show no signs of ill health, and the existence of the disease is demonstrable only by the application of the agglutination test.

Acute Form.—Adult fowls may die from acute pullorum disease, death usually resulting from a septicaemia. On post-mortem examination these cases show some inflammation of the intestine, the liver is frequently studded with very small whitish lesions, and the heart may show inflammatory tumour-like masses in the musculature. The sac surrounding the heart (pericardium) may be distended with fluid.

One of the most fruitful sources of acute pullorum disease in adult stock is the practice of feeding infertile eggs from an incubator to fowls. Many of these eggs may be infected with *S. pullorum*, and this practice should be actively discouraged. Whole flocks of hens have been infected in this way, and rendered unsuitable for breeding purposes.

Control Measures

In a discussion of the control of pullorum disease, there are three main questions to which an answer should be forthcoming, if control measures are to be effective—

1. What can be done to prevent the entrance of a disease into a hitherto clean flock?

2. What steps should be taken to limit the spread once the disease has made its appearance?

3. How can the disease be eliminated from an infected flock?

1. To prevent the introduction of pullorum disease to a clean poultry farm, it is essential that only healthy chicks or fowls, or eggs from healthy hens, be used for restocking and for breeding purposes.

The most valuable weapon available in the control of this disease, is the agglutination test. It has been quite adequately proved that, used in the proper manner, this test is as accurate as any biological test at present in use for the detection of disease.

The agglutination test is based on the fact that the blood serum of an infected fowl possesses the power of causing the clumping or agglutination of the germs (*Salmonella pullorum*) when a suspension of the germs in saline is mixed with the serum in certain proportions. This test has been applied to many thousands of blood samples at the Veterinary Research Institute during the past few years, with the result that a number of poultry farmers have been able to eliminate infected hens from their breeding stock, and consequently, to reduce their chicken mortality to a minimum. It is no exaggeration to say that several poultry men would have been forced to relinquish their business but for the use of this test.

Left, Normal ovary. Right, Ovary affected with pullorum disease. [After Rettger.

The blood samples for the test are taken by making an incision with a sharp clean knife or razor blade in the wing vein, at the point where it passes over the elbow joint. A small incision made in the direction of the length of the vein, rather than across it, is preferable. The blood is allowed to flow into small, clean, dry tubes, which may be obtained from the Institute. Immediately the samples are taken, they should be corked and forwarded at once to the laboratory by the most direct route. If practicable, it is advisable, when undertaking the collection of blood samples for the first time, to seek the assistance and advice of the Live Stock Division of the Department of Agriculture, Melbourne, or the Veterinary Research Institute, Parkville, N.2.

The agglutination test may be relied on to prevent the introduction of pullorum disease into a clean flock, and no birds should be introduced unless they have passed the agglutination test. If possible, birds should be isolated after introduction and retested after four weeks, before adding to the flock. Eggs for hatching, or day-old chicks, should only be bought from properties where the disease is not present.

In cases where it is not possible to obtain a guarantee of freedom from pullorum disease, isolate all eggs for hatching, or chicks, for four weeks after hatching, before liberating. Of course, if the disease makes its appearance in "brought-in" birds or eggs, then exceptional care must be taken in regard to isolation and disinfection of premises.

2. Should the presence of pullorum disease be suspected, it is essential that no time be lost in establishing a diagnosis. In the meantime, sick chicks should be isolated, including in-contacts, and dead birds cremated. Where only a few chicks survive, it is better to destroy them all, but when the number of in-contact survivors is great, it may prove an economic necessity to rear them to maturity. This will always prove a source of some worry, so the sanitary and hygienic arrangements should be as perfect as possible, with avoidance of overcrowding.

It has been shown that the disease may be transmitted from adult to adult by contact, so that all in-contacts and reactors to the test should be efficiently isolated. It has further been demonstrated that *Salmonella pullorum* may remain viable for 100 days in moist droppings, pointing to the necessity for every precaution against the transference of infective droppings from pen to pen.

It should be a firm rule that survivors or in-contacts of an outbreak of pullorum disease are not subsequently used for breeding purposes. If practicable, they may be reared in isolation for table purposes. If, for some special reason it is desired to breed from a survivor or in-contact, two negative blood tests at intervals of three months, should be obtained. A reactor should never be used for breeding.

Elimination of the disease from an infected stock is practicable by the regular application of the agglutination test, combined with suitable hygienic measures. First, all reacting birds should be isolated and used for table purposes; secondly, negative reactors should be placed in thoroughly disinfected separate sheds, and on clean ground. If the ground has been liable to contamination, it should be dressed with ground quicklime and poultry kept off for at least a month. Preferably, and if practicable, the top layer of the soil should be removed to a depth of 6 inches, mixed with lime and buried, using the fresh soil from the hole to replace it. Sow with grass and keep birds off until a good growth is established. Thirdly, regular testing of the negative flock, and removal of reactors as they may appear; with a heavy initial infection retest in three months, otherwise every six months should be sufficient.

Fourthly, every care should be taken to disinfect incubators and brooder houses. With regard to the latter, especially if an impervious floor exists, the use of a painter's blowlamp will prove an efficient germicide. The interior of the incubator should be thoroughly cleansed and disinfected, using either sodium hypochlorite, or formalin, or formaldehyde gas.

The best time for the application of the agglutination test to adult stock is two months after laying commences. Male birds should be tested with the hens.

Fumigation of Incubators.—Twenty cubic centimetres of formalin per 100 cubic feet of incubator space, evaporated from cheese cloth, has been found effective in destroying *Salmonella pullorum* on egg shells, cotton squares, and newly hatched chickens.

It is very desirable that poultry keepers should realize the economic significance of pullorum disease. Quite apart from the losses due to the mortality of chickens, it has been demonstrated that healthy fowls lay more eggs than reactors. For example, at the conclusion of an egg-laying competition in England, the fowls were blood tested for pullorum, and then grouped according to their reactions to the test, with the following result.

Average number of eggs laid per bird during test.

Non-reactors	.. ..	204·8
Reactors	.. ..	141·8

Such results indicate the value of blood testing and elimination of reactors, even on farms where fowls are kept for egg production and not for breeding.

The control of pullorum disease, as with every contagious disease, can be assured only by the definite co-operation between those engaged in the industry and the Department of Agriculture, which administers the Stock Diseases Act.

Summary.

1. Pullorum disease is a contagious disease of poultry, caused by a micro-organism or germ, the *Salmonella pullorum*.

2. The disease is usually accompanied by a high mortality. Recovered female chickens frequently retain the infection in their ovaries, and become "carriers."

3. The acute form among young chickens generally starts in the incubator through the hatching of infected eggs laid by a "carrier" hen.

4. Deaths occurring among newly-hatched chickens, with an increase in the rate of mortality from the fourth to the tenth day, should arouse the suspicion of the owner. In such cases, a definite diagnosis should be sought. For this purpose, preferably live chickens should be submitted to a laboratory for examination.

5. When a diagnosis of pullorum disease has been confirmed, all sick chickens should be destroyed, and all carcasses burnt.

6. Chickens in contact with diseased birds should be isolated immediately.

7. Chicken houses, incubators, brooders, &c., in which the disease has occurred, should be thoroughly and efficiently disinfected before being used again.

8. In flocks where the disease has occurred, the breeding stock should be tested, and the reactors to the test eliminated before next breeding season. Eggs from non-reacting hens only should be used for hatching. All reactors should be isolated, and used for table purposes.

9. The disease is very contagious. The germs causing the disease are present in large numbers on the bodies of diseased chickens, in the droppings, and in the litter of incubators, brooder-houses, &c. Extreme care should therefore be taken to thoroughly wash and disinfect the hands, boots, overalls, &c., after handling infected material.

The Department of Agriculture has introduced a scheme for the testing of poultry flocks and the certification of those proved to be free from pullorum disease. Full particulars of the scheme may be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owing to shortage of staff at the Veterinary Research Institute, only a limited number of blood samples can be tested, and preference for testing will be given to poultry farmers who make application for certification under the Certified Pullorum Tested Flock Scheme.

It is essential, therefore, that poultry farmers desirous of having their flocks tested should make application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2. The cost of testing is 10s. per 100 birds.

Tubes for the collection of blood will be supplied by the Veterinary Research Institute.

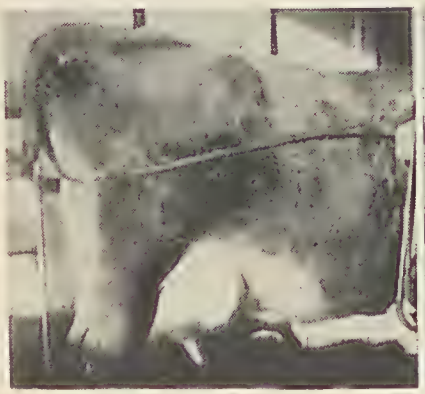
HELP YOUR NEIGHBOUR—MANY HANDS MAKE LIGHT WORK

HYGIENE IN THE DAIRY

Co-Operate for Cleanliness

By R. A. BICKNELL, Dairy Supervisor

MOST dairy farmers are fully aware of the need for cleanliness in all milking operations, but there are times, even on the best dairy farms, when relaxation of the rigid rules necessary for the production of the choicest quality dairy produce, has been noted. While lapses may be understandable, it should be borne in mind that they are not allowable.



Left.—Cow held in crush-type bail by breeching rope. Right.—The rubbing action of rope on the cow's side is indicated by the use of whiting.

To do his job properly in the interests of himself and the public, the dairy farmer must carry out the spirit no less than the letter of the Milk and Dairy Supervision Act. Dairy farmers will appreciate that, no matter what the Act says, their co-operation is essential to the fulfilment of what the Act *does not say.* For example, the Act says that the hands of the milker must be properly cleansed at the time of milking, but there is nothing to say that the milker should not touch a leg-rope, the cow's side, or other contaminated object between the time of washing the hands and the time he commences milking. The reader himself could multiply such instances a hundredfold, and in so doing he will realize just how much his care, good sense, and co-operation are necessary if the relations between himself, the consumer, and the authorities are to remain happy, not to mention the financial gain that will come his way by production of the choicest quality cream and milk, and also the prestige that attaches to the production of such goods.

For the purposes of this article, two clauses in the Milk and Dairy Supervision Act are set out hereunder:—

(1) Every owner of a dairy farm shall provide at the milking shed, during the time of milking, an ample supply of clean water, receptacles, and cloths wherewith to cleanse and dry teats and udders of the milch cows, and the hands of the person engaged in milking.

(2) Every person engaged in milking shall ensure that his hands, and the teats and udders of milch cows are properly cleansed at the time of milking.

Recent observations have shown, however, that, under certain conditions, still further precautions are essential to prevent dirt entering the milk during milking.

When wet and muddy conditions prevail, or when feed is very succulent, the cows tails may become very dirty in brushing against their legs, or dragging through mud. This mud and manure are, by the constant swishing of the tail, transferred to the flanks and thighs, and it is from here that it falls into the milk bucket during milking.

Recent inspections at farms from which milk is forwarded to milk factories revealed high dirt content by sediment test, particularly on farms using the "crush" type of bails. In this type the cows are held in place by means of a breeching rope or chain. Apart from having two ropes or chains to handle (leg and breeching ropes) both of which easily contaminate milkers' hands, if the cow's thighs and flanks are even slightly soiled with mud and manure, loose hair or scurf, any movement during milking causes the breeching to rub the dirt off and fall into the bucket.

Whiting was put on a cow's flank as illustrated. She was then made to move back a little, showing the actual rub-marks. If the

 [Continued on page 136.

FERTILIZER RATIONING NOTES

Lodge Superphosphate Orders Now

ALTHOUGH wide publicity has been given to the necessity for farmers and graziers to order and take delivery of their ration of superphosphate at the earliest possible date, some users are holding back. By so doing, they take the great risk of being unable to obtain their supplies in time for planting.

The Railway Department must give priority to Defence goods, and because of the shortage of labour and coal, cannot guarantee delivery of fertilizer just when the orders are given. The fertilizer companies too are working with a minimum of staff. Last season, some farmers who ordered late had to go without their superphosphate when railway trucks were required for Defence purposes, and the general position is much more serious now. In their own interests, growers are urged to delay no longer, but to arrange for immediate delivery of the ration of superphosphate they are entitled to.

The Superphosphate Ration—How to obtain it

Owing to restricted supplies, the superphosphate available to the great majority of farmers and graziers is only 55 per cent. of the quantity obtained last year in the six months period January to June. This ration is easily calculated, and should be ordered from the usual supplier immediately. As the ration last year was 60 per cent. of that purchased in 1939–40, it follows that the ration this year is 55 per cent. of 60 per cent = 33 per cent. or one-third of the quantity purchased in 1939–40.

Any user who, under the above plan, would not receive one-third of the quantity he normally uses may apply to the Department of Agriculture for an adjustment of his case. Adjustments made between January and June last are automatically carried forward, and no further application to the Department is required.

Full information regarding past purchases can be supplied by manufacturers and their agents, and most users have already been informed by their usual supplier as to the ration they are automatically entitled to. This should be obtained immediately, even though a claim for a larger ration may have been submitted to the Department.

The rationing plan provides that consumers should obtain their superphosphate from the agent or person who supplied them last year. When the superphosphate was obtained from another farmer, this practice should be continued. Farmers who purchased on behalf of others in the past must make available to them the appropriate share of the ration. Farmers concerned in such an arrangement, who experience difficulty in obtaining their share of superphosphate, should report the case fully and immediately to the Department.

The ration is based on the amount of superphosphate used on the particular property in the past, i.e., the ration goes with the land. Any farmer who sells or leases his property should transfer to the new occupier the appropriate ration which rightly belongs to the particular property. Farmers who acquire land therefore should take steps to have the appropriate ration transferred to them.

Growers of Priority Crops

Special rations have been reserved for the following priority crops which are planted in the autumn, viz., vegetables, blue peas and flax. Growers who require additional superphosphate for these crops after allowing for a one-third of normal ration for their non-priority crops should apply to the Department of Agriculture, or in the case of flax, to the manager of the local flax mill for the necessary application form.

Growers who have already obtained superphosphate for priority crops, e.g., potatoes, vegetables, tobacco or Navy beans, sown in the spring, and who, in addition, normally use superphosphate on non-priority crops such as pastures or cereals, should also apply to the Department for an assessment of the balance of their ration, as they will not be able to obtain it automatically from their supplier.

There are a few farmers, not being growers of priority crops, who usually purchase superphosphate in the months July to December, and who for various reasons did not take the ration which was available to them in those months last year. This is still available to them from their usual supplier. The ration is 40 per cent of the quantity

purchased from July to October, 1941, and one-third of the quantity purchased in November and December, 1941.

The Department is receiving a great number of applications for additional rations on the grounds that production will be lowered. It is regretted, but emphasized that extra superphosphate cannot be supplied for such reasons, and farmers are requested not to apply for more superphosphate unless they cannot obtain their just ration, or are growers of priority crops. By so refraining, they will enable the Department to deal more expeditiously with the bona fide cases.

All correspondence with the Department of Agriculture regarding fertilizer rations should be addressed to the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne, C.1. It is essential to state the brand of fertilizer purchased in the past, and the name of the agent or supplier concerned.

DON'T Talk or Write about Troop Movements

HYGIENE IN THE DAIRY—*continued from page 134.*

whiting had been dirt it would have been rubbed in the same direction—namely, into the bucket. This shows that, with the "crush" bails, extra precautions are needed, although they apply also to any type bails.

The main precaution is to see that the cow's body, immediately over the udder and surroundings, is free of dirt and loose hair. Where muddy conditions exist, it has been found that the clipping of a few inches of the long hair from the end of the cow's tail prevents, to a large extent, the transfer of mud to the flanks. Two or three quick sweeps over the flank and leg with a brush—a matter of seconds—will keep dirt, loose hair, and scurf down to a minimum.

Clipping of long hair from the udder and just in front of the udder permits udders and teats to be washed more quickly and effectively.

Clean yards and approaches mean relatively cleaner cows. A good pitch for drainage is essential.

On farms where these precautions have been adopted, the improvement has been outstanding.

There is one other precaution in the production of clean milk where cows are machine milked. It is to see that udders are not refouled after washing. Sometimes between the washing of udders and attaching of machines, the cow will often kick, with the free leg, towards the udder, and if the foot or leg is muddy, there is a likelihood that a considerable amount of mud will be deposited on what the milker had thought was a clean teat, and if he fails to handle the teats, which is advisable before attaching the machines, a considerable quantity of dirt will be drawn through with the milk.

IN THE ORCHARD

Contributed by the Horticultural Division

DURING March, the harvesting of the mid-season apple varieties commences. Growers will want to obtain as much fruit as possible for marketing because of the satisfactory prices which are anticipated as a result of the light crop, but various factors are at work which may rob the fruit grower of his reward for a season's strenuous work.

Prevent the pre-harvest "drop"

How frequently, for instance, during the past few years have Jonathan apple growers seen a large portion of their crop drop to the ground during a spell of hot weather in March? This phenomenon occurs almost yearly and has been the cause of serious financial loss. Fortunately, a chemical prepared in tablet form, dissolved in water and sprayed on the trees before harvest time, will prevent the weakening of the fruit stalk. To obtain the most effective use from this material, intending users should estimate the probable picking date and apply the spray ten to fourteen days before this.

The spray must be thorough and operators must make sure that the fruit stalks are well covered, otherwise the material would be wasted. The spray becomes effective two days after spraying and should last for twelve to fourteen days. One tablet costing 17s. 6d. contains sufficient material for 100-gallon vat and thus the cost for material for a tree receiving 3 gallons of spray would be less than eight pence. The fact that over a case per tree may be saved in this way means that the cost of material may be regarded as an insurance against loss. Interested growers are invited to write to the Department of Agriculture, Melbourne, C.2, for further details.

Harvesting and Cool Storage

The time of picking apples is of great importance, particularly if the fruit is intended for cool storage. The best guide to the stage of maturity of Jonathan apples is the ground colour, which is independent of the red blush of the fruit. Some growers are inclined to delay the harvesting of Jonathans until the maximum red colour has developed on the fruit. For immediate sale, this practice may be desirable, and the use of sprays as mentioned above for the prevention of dropping enables growers to do this. However, a warning is necessary in that such fruit would be over-mature for storage purposes, and in cool store would deteriorate and become mealy and flavourless.

The correct stage for picking fruit for storage is indicated when the ground colour is changing from green to yellowish-green. Colour charts showing the correct colour are available on application to the Department of Agriculture, Melbourne. At this stage, the fruit is slightly acidic, but the flavour improves in store and losses will be reduced to a minimum. In order to further reduce losses due to soft scald and breakdown, it is advisable to hold Jonathans at 36° F. until the end of April, reducing the temperature to 34° F. during May, after which the fruit should be held at 32° F. Other apple varieties should be stored at 32° F. for long storage, so that it is desirable to provide a special chamber for Jonathans.

Superficial Scald

The reduction in superficial scald of Granny Smith and Ballarat (Stewart's) by the use of oiled wrapping paper has become an established practice. Unfortunately, supplies of this type of paper are very short. There appears to be some possibility in the use of wax or oil dips for these varieties prior to storage.

Growers who intend storing a quantity of Granny Smith apples are advised that small trials with white oil emulsion used as a dip for this variety have been successful in controlling superficial scald. The white oil should be used at a strength of 1 gallon in 10 of water. A draining board should be placed adjacent to the dipping bath so that the excess emulsion will run back into the bath after the fruit has been treated. Suitable containers may be constructed by selecting smooth, strongly constructed bushel cases, boring $\frac{3}{8}$-in. holes in the sides and bottom, and fitting them with handles. After treatment, it is necessary to spread the fruit out for drying before storage. The old method of delaying storage of Granny Smith and Ballarat apples so that the fruit will develop an oily surface cannot be recommended. Not only is the practice uncertain in results, but the storage life will be reduced and bitter pit is likely to develop.

Codling Moth

Another factor likely to cause some loss at this time of the year is the codling moth. Moth activity frequently occurs during March, and because of harvesting operations spraying is neglected. It is false economy to concentrate all labour on picking when moth activity is apparent, because it is not always possible to get the fruit off the trees before it is "stung". Delaying picking for a few days in order to spray with white oil (strength 1 gallon in 80), may save hundreds of cases of fruit without building up the arsenical residue. This spray may be combined with the drop-prevention spray should it be so desired.

Spraying Citrus Trees

The spread of brown and black scales on citrus trees increases during the summer months. White oil emulsion (2 gallons in 80) applied this month will control the scales and prevent the development of sooty mould. Nicotine sulphate (strength 1 pint in 80 gallons) may be combined with this spray for the control of black citrus aphid. Where "mottle leaf" is present on orange trees a spray containing 10 lb. zinc sulphate, 5 lb. slaked lime in 100 gallons of water should be applied during March. White oil may be added to this spray for scale control.

In the Flower Garden

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

MARCH is a very bright month in the flower garden. The summer flowering annuals are usually now at their best because milder weather and the longer, dewy, cool nights allow better development of the individual blooms which are very plentiful. To maintain this bright display, the cultural practices recommended last month can be continued. Beds should be cultivated lightly with a hoe, three-pronged cultivator, or a fork. The first two implements are suitable where mulching with stable manure or compost has not been practised, but where there is a heavy mulch on the surface, a light forking through the mulch, will be found the best method of stirring the surface soil.

Liquid Manures

Watering with liquid manure once a week will be found one of the most efficient ways of adding plant foods to your soil. Liquid manures can be made in many ways. One of the simplest methods is to dissolve from $\frac{1}{2}$ to 1 oz. of sulphate of ammonia,

or nitrade of soda in each gallon of water. Both these fertilizers are difficult to purchase at the present time, and because of their scarcity, when they can be obtained, they should be used only in the vegetable garden.

Various animal manures are excellent for making into liquid manure. Stable manure, cow manure, and poultry manure are all valuable, because they supply nearly all the materials a plant requires, whereas the solution of sulphate of ammonia or nitrate of soda supplies only nitrogen. The most convenient method of preparing liquid animal manures is to place them in an old hessian bag and suspend it, just beneath the surface, in a barrel of water. Depending upon the quantity of manure and the volume of water, the strength of this liquid manure varies between wide limits. The essential thing to remember in applying liquid manure to plants is that it should be very dilute. The usual practice is to apply it after a heavy watering. The concentrated stock in the barrel should be diluted with water before use. Usually one part of liquid manure should be added to the watering can, or bucket, and diluted with from three to six parts of water. Poultry manure is an excellent manure; but it is more concentrated than stable or cow manure and should be used with caution. The safest rule to follow is "Give it weak and often".

Do not delay the planting of spring flowering bulbs and corms any longer. The soil is warm in March and the early root action under these conditions is very beneficial. Bulbs of Muscari (commonly called "Grape Hyacinth") and Lachenalia (often called "Soldiers") which were not lifted last season probably commenced growth last month and the points of the young leaves are already above the soil. These plants, like many others belonging to the Lily family, enjoy a deep, fertile moist, but well-drained, soil of a sandy loam or loamy nature. This type of soil suits most bulbs and corms.

Planting of Bulbs and Corms

Depth of planting is an important point in the culture of bulbs. As a general guide, the planting depth, measured from the top of the bulb to the soil surface, should be equal to twice the diameter of the bulb. Hyacinth, Tulip, and Daffodil bulbs are usually planted at greater depths than other bulbs. From 4 to 5 inches deep is usual for these. In heavy soils, slightly shallower plantings are preferable. Hyacinths and tulips are heavy feeders and good manuring is essential for success with these bulbs.

Hyacinths grown in bowls make an attractive indoor decoration.

When preparing the bed, dig the soil deeply and apply a light application of sieved wood-ashes. This will add lime and a small amount of potash to the soil. It is not advisable to dig in fresh stable manure before planting. A very good plan for the average garden is to reserve a bed for bulbs, because after they have grown and flowered, and the foliage has died down, they should be either lifted (say every two or three years) or if they remain in the soil, they should have a distinct rest period. Many bulbs flower much better in the second year after planting.

When planting, allow sufficient space between bulbs for proper development. Although the top growth of some bulbs is not very spreading, it is not advisable to plant too closely because the root systems spread laterally. Bulbous types of Iris should be planted about 9 to 10 inches apart, Hyacinth, Ranunculus, and Anemone about 8 inches apart, while Tulip, Ixias, and Narcissus (including Daffodils) should be planted 6 inches apart. Snowflakes, Snowdrops, Blue Bells (Scilla), Freesias, and Crocus require only about 3 inches between bulbs or corms.

Bulbs in Pots and Bowls

Bulbs suitable for growing in soil in flower-pots or in prepared fibre in bowls are Daffodils, Hyacinths, Tulips, Freesias and Lachenalias.

Select the bulbs very carefully and use only those which are well-formed and well-nourished. Plant three or four of the larger types of bulbs in a five-inch pot which has been properly crocked for drainage, and filled to within half an inch of the top with a rich, fibrous sandy-loam. The tops of the bulbs should be about half an inch below the surface of the soil. As many as six or ten bulbs or corms of the smaller plants, like Freesia, Lachenalia, or Muscari can be planted in the same-sized pot. After planting, water the pots well and stand them in a cool, shady place to encourage root growth. As soon as the green tops appear, move the pots into a warm, sunny position. Water regularly and if necessary, apply liquid manure sparingly.

The main points of difference between growing bulbs in pots and bowls is that the latter are not provided with a drainage hole and therefore a special bulb fibre should be used. A bowl about 4 inches deep will be suitable. A thin layer of broken charcoal should be placed in the bottom of the bowl and the fibre pressed firmly into the bowl. Place the bulbs in the fibre, so that the tips are about half an inch below the rim of the bowl and press the fibre firmly around them and down to about the same level. Treat the bowl in a similar manner to that suggested for the flower pot except that after watering, the excessive moisture should be drained out by supporting the bowl on its side. After a little practice, the correct amount of water to give the bowl can be gauged fairly accurately. When the flowers in the pots or bowls commence to open, they may be brought inside.

IN THE VEGETABLE GARDEN

Warnings have been issued again that vegetables may be scarce this winter, and therefore it behoves everyone, with a small piece of suitable land and the necessary time, to do their utmost to relieve the position.

During March, the following varieties of cabbages can be planted out, but it is rather late for seed sowing—*Enkhuizen Glory, Early Allhead, Drumhead, Eastham, and Savoy. Phenomenal Maincrop* cauliflower, as well as Brussels sprouts can also be planted.

In rich, fertile soil *Prickly Seeded Spinach* can be sown in drills about 15 inches apart, covering the seed to a depth of half an inch. Silver beet plants can be set out in rows, leaving a spacing of about 12 inches between the plants and 20 inches between the rows. If this vegetable is established quickly, it will provide useful greens in early winter. Choose a warm sunny situation for this late planting.

Cabbages, cauliflowers, spinach, and silver beet require generous fertilizer applications. Blood and bone or market garden manure at the rate of 4 or 5 oz. per square yard in addition to liberal stable manure dressings will not be too much for the average garden soils. For the more fertile soils, half this application will be sufficient.

It is now too late to sow French beans, but the first sowing of Broad beans can be made. *Cole's Dwarf Prolific* and *Leviathan Long Pod* are useful varieties. Space the rows 24 inches apart or if a double row is preferred, space them 6 inches apart with 24 inches between each double row. Many growers like the double row system of planting because the plants can be more easily supported. Allow a spacing of 9 inches between the plants in the row and cover the seed with about 2 inches of soil.

Early varieties of onion can still be sown in seed-beds—*Silverskin, Early Barletta, Early Brown Globe* and *Odourless* being suitable at this time of the year. Firm the seed in the seed-bed and cover with about half an inch of soil. Spring onions may also be sown now in well-prepared beds. They should be grown quickly for the best results.

Sow *Champion Purple Top* swede turnip in drills about 20 inches apart and later thin out to 6 to 7 inches. Cover the seed not more than half an inch deep.

When the pumpkin plants have died down, harvest the pumpkins and store them in a dry, airy place. Pumpkins can be kept for many months provided that the storage conditions are suitable. Inspect them at regular intervals and use those which are showing the first signs of decay. Marrows are usually harvested in the immature condition and size is often the guide to the correct stage for picking. They will not store for a long period like the pumpkin, and as a rule they must be used shortly after picking.

MAKE THE GOOD NEIGHBOUR POLICY YOUR POLICY

CODLING MOTH IN WILLIAMS' PEARS

By. L. W. MILLER, B.Agr.Sc., Assistant Entomologist, Biological Branch

The following article is the concluding portion of a report covering the period 1936-41, and dealing with the codling moth problem in Williams' pears, in the Goulburn Valley district. The first instalment was published in the January number of the Journal. It included life history studies of the codling moth, and dealt with spring brood emergence and moth activity.

Codling Moth Control

The main purpose of this investigation was to obtain a more satisfactory control of codling moth than was being obtained by the majority of orchardists. Orchard investigations included both banding and spraying experiments.

Banding Experiments.

Banding experiments were conducted for two seasons mainly to determine the relative efficiency of hessian and B.-naphthol bands.

A block of 80 W.B.C. pear trees was used for these banding experiments. The plots were laid out in the form of a randomised block, each treatment being replicated five times, the unit of treatment being four trees.

SEASON 1936-37.

Table 7.—Details of Banding Tests—Ardmona, 1936-37.

Treatment Number.	Type of Band.	Average Number of Larvae per Plot.
1	Chemically treated (B.-naphthol in mineral oil) corrugated	14·2
2	Untreated corrugated cardboard band	4·8
3	Hessian band	40·6
4	Combined band—half untreated cardboard half chemically treated (B.-naphthol) band	7·6
	Difference for significance	6·16

The untreated bands—both hessian and cardboard—were removed each week and the numbers of larvae recorded. The chemically treated sections, however, remained untouched until the end of the season, when they were removed, the numbers of larvae recorded, and the percentage mortality due to the B.-naphthol determined, which for this season was 76.05 per cent.

Reference to Table 7 shows that the hessian bands were far superior, in the number of larvae trapped, to either the chemically treated or the untreated corrugated cardboard bandages. The chemically treated bands, however, trapped a greater number of larvae than the untreated cardboard bands.

In Treatment 4, where each band consisted of half untreated and half chemically treated cardboard, the position of the components was varied according to the points of the compass in each unit of four trees so as to obviate errors due to the relative positions of these components on the trunk of the tree.

Table 8.—Number of Larvae Trapped in the Components of the Composite Band (Treatment 4).

Component.	Average Number of Larvae per Plot.
Untreated corrugated cardboard section ..	1·4
Chemically treated corrugated cardboard section	6·2
Difference for significance	1·0

Thus, in the composite bands, the chemically treated section trapped a greater number of larvae than did the untreated section.

SEASON 1937-38.

TABLE 9.—DETAILS OF BANDING TESTS, 1937-38.

Treatment Number.	Type of Band.	Average Number of Larvae per Plot.
1	Chemically treated (B.-naphthol in oil) corrugated bands	19·8
2	Double bands—one hessian and one chemically treated band on each tree	63·2
3	Hessian bands	41·0
4	Chemically treated corrugated—at the completion of the first brood —this band was removed and replaced by a fresh chemically treated band	21·2
	Difference for significance	16·0

As in the previous season, the hessian bands again trapped a greater number of larvae than the chemically treated bands. Of the larvae trapped in the chemically treated bands, 97.5 per cent. were found to be killed by the toxic action of the B.-naphthol.

In Treatment 2 above, where there was a hessian and a chemically treated band on each tree, the bands were put on so that in each unit of four trees the hessian bands were above the chemically treated bands on two of the trees and the positions were reversed on the remaining two trees.

TABLE 10.—NUMBERS OF LARVAE IN EACH COMPONENT OF THE DOUBLE BAND.

Type of Band.	Average Number of Larvae per Plot.
Hessian band	49·2
Chemically treated corrugated band ..	14·0
Difference for significance	15·2

There was again a greater number of larvae trapped in the hessian band than in the chemically treated portion of the "double" band.

In Treatment 4 the chemically treated bands were removed on 14th January, 1938, the number of larvae recorded, and fresh chemically treated bands were placed on the trees. This was done in order to compare the numbers of first brood larvae trapped in the bands with the numbers trapped from later broods so as to determine whether B.-naphthol was effective against first brood larvae that would normally be transforming within a short period.

TABLE 11.—NUMBERS OF LARVAE OF FIRST OR LATER BROODS TRAPPED IN CHEMICAL BANDS.

—	Average Number of Larvae per Plot.
First brood larvae	15·2
Larvae from later broods	6·0
Difference for significance	3·0

Thus the number of first brood larvae trapped was significantly greater than the number of larvae from later broods. Furthermore, there was a complete kill of the first brood larvae by the Beta naphthol.

Discussion on Banding Experiments

Throughout the banding experiments it was found that a greater number of larvae were trapped in hessian bands than in chemically treated bands. Of course, with hessian bands the extra labour involved in their maintenance would tend to nullify their greater efficiency.

The presence of the Beta naphthol did not appear to make the corrugated bands repellent to the larvae since a greater number of larvae were trapped in the treated bands than in untreated corrugated cardboard bands.

Owing to the irregular shape of most W.B.C. pear butts, it is frequently difficult to obtain a close fitting band even when a flexible material such as hessian is used. With an inelastic material such as corrugated cardboard, however, a number of gaps may be left between the butt and the band beneath which the larvae can crawl without actually contacting the band. Thus the ability of a material to form a close fitting band may play a vital part in determining its efficiency as a banding material for W.B.C. pears. Furthermore, the use of bands as a supplementary control measure is probably less effective on W.B.C. pears than on many apple varieties, since not only are the pear butts irregular in shape, but, in addition, even on well-scraped pear trees there are still many cracks and crevices in the butts which constitute cocooning sites for the larvae which are quite as satisfactory as the bands.

Orchard Spraying Experiments

During the first two seasons of the investigation, a block of 1,024 W.B.C. pears was used as the site of the spray-tests. The block was in the form of a square 32 x 32. The lay-out was in the form of a Latin square with eight replicates of each of the eight spray schedules. Each plot consisted of sixteen trees in a square 4 x 4, the four centre trees of which were used to assess the degree of codling infestation.

The orchard spraying tests for the last three seasons were conducted on a different block of pears from the above. This block consisted of 432 W.B.C. pears in a rectangle of 18 x 24. The unit of treatment was a block of twelve trees 3 x 4, of which the centre two trees were used to determine the infestation figures. Six spray schedules each of which was replicated six times were tested in each season.

Sprays were applied at a pressure of approximately 300 lb./in.^{2}, using disc nozzles on a long rod. Lead arsenate paste was used throughout the investigation, as this was the form most used in the area.

At harvest time, all the fruit from the count trees was examined to determine the percentage of infested fruit. In addition, all windfall fruit from the count trees was picked up during the season, examined, and included in the final figures.

Throughout the investigation, calyx sprays were applied at petal fall unless otherwise mentioned. The calyces of W.B.C. pears do not close rapidly, as is the case with many apple varieties, thus the second spray which is normally applied approximately 10-14 days after petal fall, although applied following the activity of the spring brood moths, may be termed either a second calyx or a first cover spray.

SEASON 1936-37.

Eight spray schedules were used during the season. A progress report covering the results obtained during this season was published by Pescott and Miller (1937).

The main features of this season's control experiments were:—

(*a*) That the use of 1 lb. calcium caseinate spreader resulted in inferior control. The failure of this schedule to adequately control the codling moth was found from arsenical analyses to be due to the excessive run-off caused by this amount of spreader.

(*b*) The use of 8 lb. of lead arsenate paste to 80 gallons did not significantly improve the control when compared with a spray schedule where only 5 lb. of lead arsenate paste was used.

(*c*) That the addition of nicotine sulphate in the cover sprays was not warranted nor was the application of an additional calyx spray as in Schedule 7.

TABLE 12.—DETAILS OF SPRAY SCHEDULES APPLIED, 1936-37.

Schedule Number.	Details of Spray Schedules.	Average Percentage of Infestation.
1	Calyx and three cover sprays of lead arsenate paste, 5 lb. to 80 gals.	9·45
2	Two calyx and two cover sprays of lead arsenate paste, 5 lb. to 80 gals.	7·43
3	Two calyx and two cover sprays of lead arsenate paste 8 lb. to 80 gals.	5·49
4	Two calyx and two cover sprays of lead arsenate paste, 5 lb. to 80 gals. plus 1 lb. calcium caseinate	11·10
5	Two calyx and two cover sprays of lead arsenate paste 5 lb. plus 1 pt. white oil emulsion to 80 gals.	7·19
6	Two calyx and one cover spray of lead arsenate paste 5 lb. to 80 gals.	8·49
7	Three calyx and two cover sprays of lead arsenate paste 5 lb. to 80 gals.	5·65
8	Two calyx sprays lead arsenate paste 5 lb. to 80 gals. and two cover sprays lead arsenate paste 5 lb., plus 1 pint nicotine sulphate to 80 gals.	7·63
	Difference for significance	2·47

SEASON 1937-38.

Eight different spray schedules were again tested in this season. Full details of the results obtained have already been published by Miller (1938). The main features of the spraying experiments are recapitulated here.

From these results it was apparent that lead arsenate at 5 lb. to 80 gallons was the most

economically efficient quantity of this insecticide, since when the quantity was decreased to 3 lb. inferior control was obtained, but the use of increased amounts, i.e., 8 lb. to 80 gallons, did not significantly improve the control.

TABLE 13.—DETAILS OF SPRAY SCHEDULES, 1937-38.

Schedule Number.	Details of Spray Schedules.	Average Percentage of Infestation.
1	One calyx and two cover sprays of lead arsenate 5 lb. to 80 gals.	9·58
2	Two calyx and two covers of lead arsenate 3 lb. to 80 gals.	11·53
3	Two calyx and two covers of lead arsenate 5 lb. to 80 gals.	8·12
4	Two calyx and two covers of lead arsenate 8 lb. to 80 gals.	6·04
5	Two calyx lead arsenate 5 lb. to 80 gals., two covers white oil emulsion 1 gal. to 60 gals.	6·60
6	One calyx and two covers lead arsenate 5 lb. to 80 gals.	13·90
7	Two calyx and two covers lead arsenate 5 lb. plus 1 pint white oil emulsion to 80 gals.	6·43
8	Two calyx and two covers lead arsenate 5 lb., plus 1 gal. white oil emulsion to 80 gals.	3·83
Difference for significance		2·30

In Schedule 6, a single calyx application was made approximately fourteen days after petal fall. The degree of infestation resulting (13.90 per cent.) was a clear illustration that the practice of using a single delayed calyx application was unsatisfactory.

The value of a calyx spray applied at petal fall was recently investigated by Waddell and Marshall (1942). These workers found that the application of the calyx spray to apples was sound practice in British Columbia, since it deposited poison on the inner surface of the sepals, ensured protection prior to hatching of the earliest first-brood larvae, acted as a basis for later sprays, and so contributed to a maximum deposit when attack by the first-brood larvae became general. An interesting feature of this work was the confirmation obtained for the earlier suggestion by Wiesmann (1927) that the calyx spray was effective, not so much by virtue of the amount of poison deposited within the inner calyx cup, as by the deposition of poison on the sepals, since it was on these portions that the young codling larvae attacked on penetrating the calyx cup.

Schedule 8, where combination sprays of lead arsenate and white oil emulsion were used, gave a most satisfactory control of codling moth. The value of this combination schedule appeared to be not only in the ovicidal value of the white oil emulsion, but also to the heavier arsenical deposit resulting from its use.

The ovicidal value of the petroleum oil in lead arsenate-oil mixtures has long been recognized, but it was not until the work of Spuler et al (1931) that the influence of the oil on the arsenical deposit received much attention.

SEASON 1938-39.

In the 1937-38 season, it was found that four applications of a combination spray consisting of lead arsenate paste 5 lb. plus 1 gallon of white oil emulsion in 80 gallons of water was the most efficient spray schedule tested. It was felt, however, that the cost of this spray schedule was too high to warrant its general use by orchardists. Consequently, the tests conducted during 1938-39 were designed to investigate whether the amount of white oil emulsion in such combination sprays could be reduced without materially affecting the control of codling moth obtained. With this object in view, six different spray schedules were applied, five of which consisted of combination sprays containing varying amounts of white oil emulsion with lead arsenate.

TABLE 14.—DETAILS OF SPRAY SCHEDULES USED, 1938-39.

Schedule Number.	Composition of Sprays			Percentage of Infestation.
	Lead Arsenate Paste.	White Oil Emulsion.	Water.	
	lb.	Pint.	gals.	
1	5	1	80	7·62
2	5	1	80	4·98
3	5	2	80	4·82
4	5	4	80	2·72
5	5	6	80	2·36
6	5	8	80	1·35
Difference for significance ..				1·48

Thus the addition of white oil emulsion resulted in a significantly improved control of codling moth. There was, however, no improvement when the amount of oil in the

combination sprays was increased from 1 to 2 pints.

When the quantity of oil in the combination schedule was increased to 4 pints to 80 gallons (Schedule 4) there was a significant improvement in the control of codling moth obtained as compared to the control achieved with combination schedules containing smaller quantities of oil (Schedules 2 and 3).

The use of quantities of oil in excess of 4 pints in 80 gallons, i.e., those containing 6 pints (Schedule 5) or 8 pints (Schedule 6) did not result in a corresponding significant improvement in the control of codling moth.

The superiority of the petroleum oil-lead arsenate mixture containing 4 pints of oil over the one containing 2 pints of oil would appear to be due to the added ovicidal value of the former, since arsenical analyses revealed no significant difference between the arsenical deposits resulting from these two combination schedules. The ovicidal value of the relatively small quantity of oil in such combination sprays was examined by Marshall (1937), who found that in laboratory tests 90.6 per cent. of the eggs were killed by a combination spray containing .5 per cent. of petroleum oil emulsified with ammonium caseinate.

During the season it was found necessary to use five applications of each spray schedule.

The dates on which sprays were applied were as follow:—

Calyx spray	12-15 Oct., 1938.
1st Cover spray (or 2nd Calyx spray) ..	19-21 Oct., 1938.
2nd Cover spray ..	17-18 Nov., 1938.
3rd Cover spray ..	21-22 Dec., 1938.
4th Cover spray ..	12-13 Jan., 1939.

SEASON 1939-40.

Three spray applications only were used in 1939-40 season, all of which were directed against the first brood. As will be seen from the lure graph for this season (Graph 2)* there was very little moth activity later in the season on the experimental block. For this reason no sprays were applied after 22nd November, consequently there was no difference between Schedules 4, 5, and 6 (Table 15) each of which received identical first-brood applications.

The addition of petroleum oil to the lead arsenate was again found to significantly improve the control.

The use of 3 pints of white oil in the lead arsenate-oil sprays was no improvement over sprays where only 1 pint of oil was used. Both these schedules, however, were inferior to those where 4 pints of white oil emulsion was used.

The main feature of this season's work, however, was the proof that quite a satisfactory control of codling moth on W.B.C. pears could be obtained by the use of a calyx and two cover sprays against the first brood.

TABLE 15.—DETAILS OF SPRAY SCHEDULES, 1939-40.

Schedule Number.	Details of Spray Schedules.	Average Percentage of Infestation.
1	One calyx and two cover sprays of lead arsenate paste 5 lb. to 80 gals.	8·73
2	One calyx and two cover sprays of lead arsenate paste 5 lb., plus 1 pint white oil emulsion to 80 gals.	6·02
3	One calyx and two cover sprays of lead arsenate paste 5 lb., plus 3 pints white oil emulsion to 80 gals.	5·70
4	One calyx and two cover sprays of lead arsenate paste 5 lb., plus 4 pints white oil emulsion to 80 gals.	2·77
5	One calyx and two cover sprays of lead arsenate paste 5 lb., plus 4 pints white oil emulsion to 80 gals.	3·15
6	One calyx and two cover sprays of lead arsenate paste 5 lb., plus 4 pints white oil emulsion to 80 gals.	3·14
Difference for significance		2·28

SEASON 1940-41.

Reference to the lure graph for the 1940-41 season (Graph 2)* shows that not only was the activity restricted to the early portion of the season, but the main peak of activity occurred on the 14th October. Thus quite reasonable results were achieved where only two sprays were applied, as in Schedule 4. (See Table 16 on following page.)

From these results it was found that for this season at least, the use of white oil could be dispensed with in the calyx spray, provided it was used in combination with the lead arsenate in each of the cover sprays against the first brood.

* See p. 44, January *Journal.*

TABLE 16.—DETAILS OF SPRAY SCHEDULES, 1940-41.

Schedule Number.	Details of Schedules.			Average Percentage Infestation.
	Calyx Spray.	First Cover Spray.	Second Cover Spray.	
1	Lead arsenate 5–80 ..	Same as calyx	Same as calyx	6·36
2	Lead arsenate 5–80 ..	Lead arsenate 5–80 and 4 pints white oil emulsion	Same as first cover spray ..	3·14
3	Lead arsenate 5–80 and 4 pints white oil	Same as calyx spray ..	Same as calyx spray ..	2·35
4	Lead arsenate 5–80 and 4 pints white oil	Same as calyx spray ..	.. .. ..	5·78
5	Lead arsenate 5–80 and 4 pints white oil	Same as calyx spray ..	White oil emulsion 4 pints to 80 gals.	3·69
6	Lead arsenate 5–80 ..	Lead arsenate 5–80 and 4 pints white oil emulsion	Lead arsenate 5–80 ..	3·89
Difference for significance				1·51

These results again showed that on W.B.C. pears where the moth population had been reduced to a fairly low level, an effective control of codling moth could be obtained by the use of three thorough spray applications against the first brood.

General Discussion on Control of Codling Moth by Spraying

The following factors have been found to be of importance in determining the success of spray schedules against the codling moth in W.B.C. pears in the Goulburn Valley.

1. Thorough Spraying with Adequate Equipment.

This factor constitutes one of the most serious weaknesses in the commercial control of codling moth in the Goulburn Valley. Unless the equipment is adequate for the acreage to be sprayed it is impossible to complete the applications within a reasonable period. Furthermore, there is a tendency, where the equipment is inadequate, for orchardists to spray less thoroughly in their haste to complete the application.

To be thoroughly sprayed, a pear tree must be completely wetted, i.e., until it drips, particular attention being directed to the top and interior of the tree.

2. Timing of Spray Applications.

To effectively control the codling moth with lead arsenate, a high deposit of the insecticide should be present on the fruit when the eggs hatch. In some areas, it may be necessary to maintain a high deposit of arsenic on the fruit throughout the greater part of the season. In the Goulburn Valley, however, satisfactory results can be obtained by the more economical method of applying sprays to coincide with the periods of maximum hatching of the eggs. In such a case, it is vital that the sprays should be accurately timed. Lures, if read at frequent intervals, are fairly reliable, provided an orchard can be sprayed within the incubation period of the eggs. Since this is frequently not practicable some method of forecasting periods of maximum oviposition becomes necessary. A method for forecasting brood emergence by the application of the relationship between codling moth and the weather appears to be practicable for the Goulburn Valley.

3. Spraying to Eliminate the First Brood.

A major effort should be made to achieve the maximum control of the first brood. By so doing, there is little danger of severe second-brood attack and in many cases second-brood sprays may not be necessary.

In order to obtain a maximum control of the first brood, three thorough and correctly timed spray applications are necessary. The calyx spray *must* be applied at *petal fall* and not delayed simply because the calyx cups may not be closing quickly. The first and second cover sprays should be applied to coincide with periods of maximum oviposition and the spraying should be extremely thorough.

4. Choosing an Adequate Spray Schedule.

Lead arsenate-white oil mixtures have been found to be superior to lead arsenate in controlling codling moth, particularly when used in the first-brood sprays. It is, however, a matter for each individual orchardist to decide a suitable spray schedule for his own conditions. On orchards where codling moth infestations have been severe, it would be advisable to use lead arsenate-white oil mixtures (4 pints white oil to 80 gallons) throughout the season until the infestation has been reduced. For other orchardists, such a severe schedule would not be necessary, but in the majority of cases, it would be advisable to use the combination spray of lead arsenate 5 lb. paste or 2½ lb. powder and 4 pints of white oil emulsion to 80 gallons for both the first and second cover sprays against the first brood.

It must be clearly understood, however, that no matter what spray schedule is used the spraying must be thorough and correctly timed to be effective.

Summary

The codling moth (*C. pomonella* L.) is the most serious pest of Williams' Bon Chretien pears in the Goulburn Valley. In view of the losses that were being experienced in this area an investigation of the problem was commenced in 1936 and continued for a period of five years.

Laboratory life history studies were conducted for two years to obtain a knowledge of the bionomics of the pest in the Goulburn Valley.

The incubation period of the egg ranged from 3-15 days, depending on the temperature, being shortest in the summer and longest in the spring and autumn.

The larval feeding period varied from 11-56 days, with averages of approximately 27 days for the first brood, 21 days for the second brood, and 23 days for the third brood. In each brood a proportion of the larvae overwintered until the following season.

The cocoon period for transforming individuals averaged from 20-24 days, whereas with over-wintering individuals the period averaged approximately 280 days.

The prepupal period averaged from 6-8 days during the summer and approximately 261 days for over-wintering individuals. The duration of the pupal period averaged from 13-21 days, depending on the temperatures. The codling moth was found to be unable to overwinter as a pupa.

The length of life of the adults when confined in glass jars averaged from 6-11 days, but may be as long as 32 days. Egg deposition usually commenced 2-5 days after emergence and continued for from 4-11 days.

The life cycle for transforming individuals averaged from 48-62 days, depending on the brood. The life cycle of overwintering individuals averaged approximately 285 days.

In 1936-37 there were two complete or partial generations in the laboratory, but in 1937-38 there were three such generations.

The influence of the site of hibernation of the over-wintering larvae on the date of the emergence of the spring brood moths was determined by the use of emergence cages. Moths in the cooler southerly cages were found to emerge much later than those in the north and east cages.

Moth activity in the orchard was determined by the use of lures, the catches from which were used as a basis for timing spray applications. When, however, the incubation period of the eggs was seven days or less, lure records were found to be unsuitable for the timing of spray applications on a commercial basis even when daily records of lure catches were taken. When the catches were recorded at less frequent intervals, lure records were too unreliable to be used for the correct timing of spray applications. A more satisfactory method for timing spray applications by the use of temperature and humidity data would appear to be practicable for the Goulburn Valley.

Banding experiments revealed that hessian bands trapped a larger number of larvae than did chemically treated corrugated cardboard bands. The superiority of the hessian bands seemed to be largely due to the closer fitting bands that were obtained with this material on pear butts, since the presence of the Beta naphthol in the chemically treated bands did not appear to be repellent to the larvae.

From field spraying trials, it was found that the timing and the thoroughness of the spray applications were of major importance in determining the success of any spray schedule. Furthermore, when a maximum effort was directed towards the elimination of the first brood the danger of infestation from later broods was minimized. Three sprays—a calyx and two cover sprays—were normally required against the first brood. It was found imperative that the calyx spray should be applied at petal fall and not delayed for 10-14 days if satisfactory results were to be achieved. The two cover sprays against the first brood should then be applied to coincide with periods of maximum oviposition. The effectiveness of these first-brood sprays determined the necessity or otherwise of later sprays.

The most economically efficient strength of lead arsenate was found to be 5 lb. of paste or 2½ lb. of powder to 80 gallons of water. Unsatisfactory results were obtained when a spreader, such as calcium caseinate, was used, owing to the excessive run off and the ease of weathering of the resultant deposit.

The addition of nicotine sulphate to lead arsenate in the cover sprays was not warranted. The use of cover sprays of white oil emulsion, at a strength of 1 gallon to 60 gallons, did not result in any decrease in the infestation when compared with less expensive schedules where lead arsenate was used throughout the season.

Lead arsenate-white oil mixtures were found to be superior to lead arsenate even when quantities as small as 1 pint to 80 gallons were used. When the quantity of white oil emulsion was increased to 4 pints to 80 gallons highly satisfactory results were obtained. The use of larger quantities of white oil emulsion in such combinations, however, was not warranted. Lead arsenate-white oil mixtures containing the above quantity of white oil should be used for at least both the cover sprays against the first brood.

Acknowledgments

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Acknowledgment is also made of the assistance given on many occasions by the staff of the Ardmona Cannery, Mooroopna, and members of the Executive of the Northern Victoria Fruitgrowers Association.

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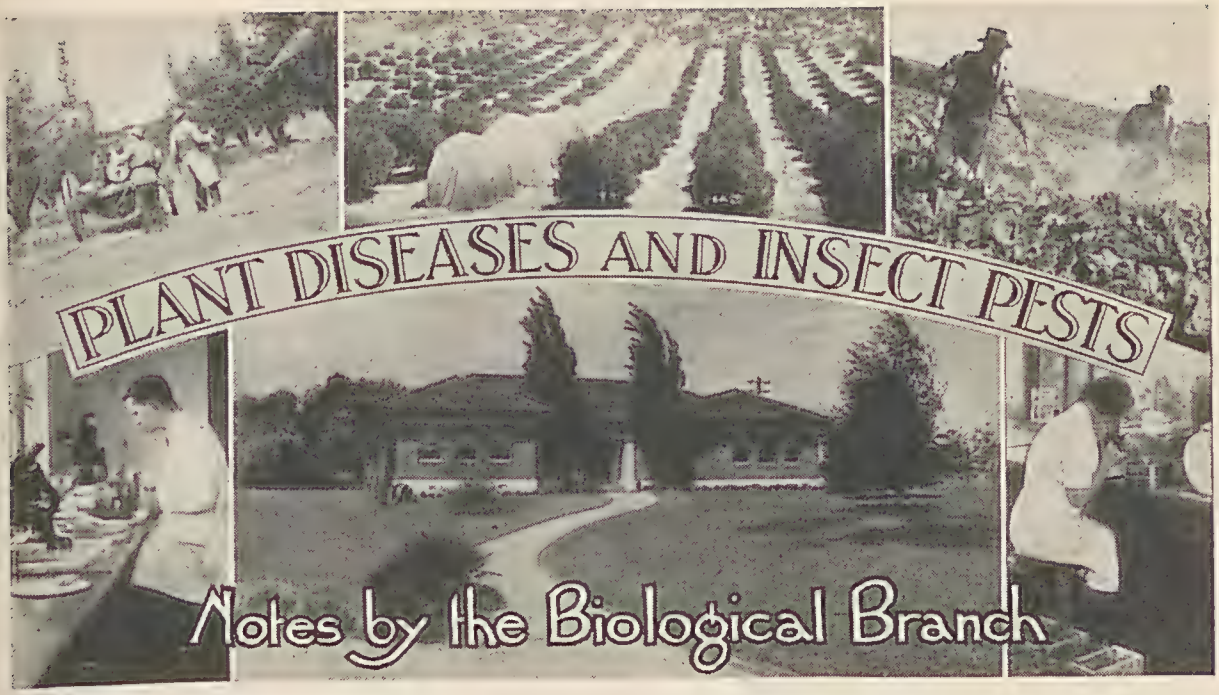
HELP YOUR NEIGHBOUR - - - UNITY IS STRENGTH



BEAN MOSAIC

The importance of mosaic, a virus disease of French beans, is frequently not realized by growers, because of the unspectacular nature of the disease symptoms. This insidious disease, however, may cause a great reduction in yield, and is doubly dangerous because of the fact that it is one of the few virus diseases that is seed-borne.

Disease symptoms vary somewhat, according to climatic conditions, time of infection and the variety affected, but with a little practice the average grower can easily identify the disease.

If a plant has been raised from an infected seed, the earliest symptoms usually appear on the first compound leaf, and consist of a light and dark-green mottling, accompanied by a downward cupping of the margins of the leaflets. Identical symptoms develop on later-formed leaves which may also become puckered, and in some varieties, the dark-green areas appear as blisters on the surfaces of the leaves.

Plants of a susceptible variety raised from infected seed are severely dwarfed and may not produce any seed. This type of symptom has been particularly noticeable in the Small White variety of Navy bean which has been sown over a wide acreage in Victoria during the present season. This variety is classed in the very susceptible group, whereas the variety Robust is extremely resistant to mosaic. All varieties of French beans grown in Victoria are susceptible to mosaic.

Plants which become infected during the growing season are not dwarfed to such an extent and, for this reason, they are more dangerous than the initially infected plants, as they produce a greater yield of infected seed.

The disease is spread from infected to healthy plants by sucking insects such as aphids, and is usually more prevalent in early-sown than in late-sown crops, due to the greater insect activity in the early summer months.

French bean leaves infected with Mosaic.

Bacterial canker—Tomatoes showing infection on one side of leaf only.

Thus the extent of mosaic in a field is dependent on two factors, firstly on the initial seed infection, and secondly on the abundance of insects which spread the disease.

In future, growers who wish to obtain seed free from this disease should delay the sowing of their seed crops until the advent of warm weather, when aphid activity is at a minimum; and must be prepared to rogue their crops periodically throughout the growing season. The first rogueing should be attempted immediately after the appearance of the first compound leaves, and should then be repeated at fortnightly intervals. The early rogueings must be very thorough, as any diseased plants missed will act as reservoirs for the infection of surrounding plants.

Growers are advised to concentrate on a relatively small area isolated from other bean crops, otherwise the rogueing-out process may be defeated by the spread of infection from a near-by infected crop.

It is strongly recommended that Navy bean growers should familiarize themselves with the symptoms of mosaic, during the present season, as evidence collected in the course of a recent survey indicates that the disease is spreading, and if a higher percentage of infected seed is produced, may cause serious reductions in yield in the future.

BACTERIAL CANKER OF TOMATOES

Bacterial canker is a wilt disease of tomatoes which also may cause a spotting of the fruit, particularly in wet seasons.

The earliest symptom appears when the lower leaves of an infected plant commence to wilt and die. As the disease progresses slowly up the plant, the leaves turn brown, but usually remain attached to the stem. Sometimes only one side of a plant may be affected, or occasionally the leaflets on one side of a compound leaf become shrivelled while the other side of the leaf may appear quite normal. A cross section of the upper portion of an infected stem usually reveals a yellowish discoloration where the bacteria have invaded the water-conducting vessels of the plant. Grey or greyish-brown streaks which split open and form cankers sometimes appear on the surface of the stems. Fruit spots, if they develop, are rarely greater than an eighth of an inch in diameter, and are slightly raised white spots with tan centres.

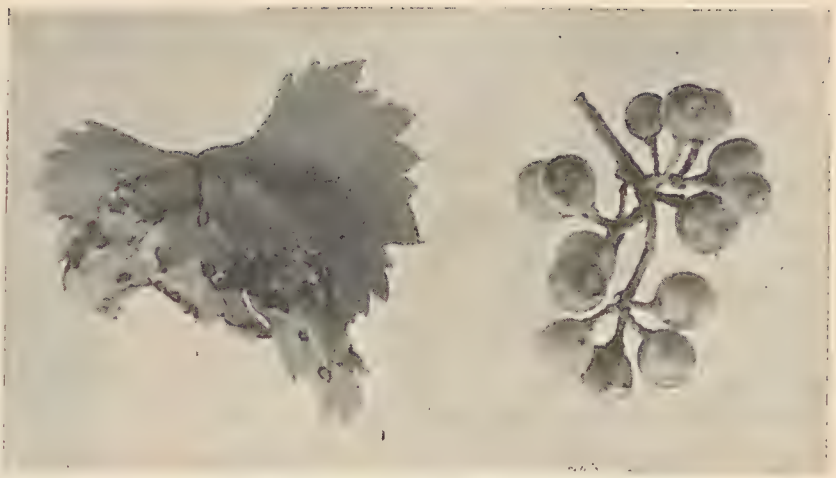
The bacteria responsible for this disease are carried within and on the surface of the seed, and it is important therefore that seed should be selected only from clean fields. As an added precaution, seed should be extracted from the fruit by fermentation with the pulp without water for at least two days, and seed of unknown origin should be treated for five minutes with mercuric chloride (corrosive sublimate) at a strength of $\frac{1}{4}$ oz. in 5 gallons of water. Finally the seed should be washed in running water for ten to fifteen minutes.

A field that has produced an infected crop of tomatoes, should not be planted with tomatoes the following season, because of the likelihood of the disease being carried over in decaying refuse in the soil.

BLACK SPOT OR ANTHRACNOSE OF THE VINE

Black Spot or Anthracnose is one of the commonest diseases of the vine in this State, and many inquiries regarding the disease have been received this season.

The disease is caused by a fungal organism—*Elsinoe ampelina* (*Gloeosporium ampelophagum*)—which attacks several parts of the vine, but probably the effect on the fruit will be the first symptom noted by the grower. If the berries are attacked at a very early stage of development, they will blacken and fall, but if the fungus infects the berries when they are at a later stage, purplish spots, which may be brownish at the centre, develop. Several spots, which later coalesce, causing a large blemish, may occur on one berry, and may lead to the cracking of the berries. If the fruit stalks are also attacked, many of the berries will fall.



Grape-vine leaf and fruits affected with Black Spot.

The fungus causes tan-coloured spots, with darker-brown margins, on the leaves. If the lesions develop on the midrib or a main vein, considerable distortion of the leaf occurs.

Infection of the canes results in purplish-coloured spots, which become sunken and develop a surrounding ridge of raised cane tissue. This phase of the disease is important because the infection extends deeply into the cane and the fungus overwinters in these lesions.

Control

1. During pruning, badly infected canes should be removed and destroyed by burning.

2. Swab the canes during the dormant period with the following solution :—

Sulphate of iron	20 lb.
Sulphuric acid (commercial) ..	8 lb.
Water	10 gallons

The home gardener will probably find 1 gallon of the solution sufficient, and to prepare this quantity, pour 13 oz. of sulphuric acid over 2 lb. of iron sulphate, and then dissolve the iron sulphate in 1 gallon of water. The operation must be performed in a non-metallic vessel (such as a wooden tub), and the solution must be handled with care, as it is corrosive to skin and clothing. It may be applied to the canes with a brush or a mop.

3. Spray the canes with 10 : 5 : 50 Bordeaux mixture at bud burst and with 6 : 4 : 40 Bordeaux just before blooming and after fruit setting. No spray should be applied at the time of blooming. If the season is very favorable to the disease further sprays should be applied when the disease reappears.

The home gardener will find 5 gallons sufficient for his purpose. To prepare this quantity of 10 : 5 : 50 Bordeaux mixture, dissolve 1 lb. of copper sulphate (bluestone) in 2½ gallons of water in a non-metallic vessel. The fine crystalline form, known as Neige crystals, dissolves more readily than other forms. Mix ½ lb. of either quicklime or slaked lime with 2½ gallons of water in another vessel. Then mix the two solutions by pouring them simultaneously into a third vessel.

6 : 4 : 40 Bordeaux is prepared in a similar way except that ¾ lb. of copper sulphate is used instead of 1 lb. The other quantities are the same. The grower can readily work out different quantities if he remembers that the first figure in the formula refers to the copper sulphate in lbs., the second to the lime in lbs., and the third to the water in gallons.

To prepare a large quantity of the spray in the spray vat, dissolve the copper sulphate in 4 gallons less than the full quantity of water in the spray vat. When it has dissolved, mix the lime with a kerosene tin full of water, start the agitators running, and pour the lime into the copper sulphate solution.

THE PEA MITE AND RED-LEGGED EARTH MITE

Immediately following the advent of substantial autumn rains, growers of pastures, vegetables, and garden plants can expect damage from the Red-legged Earth Mite, commonly confused with the Pea Mite, and more often than not erroneously called the Red Spider.

These mites are primarily seedling pests, but can, on occasions, cause serious losses to well-grown plants. The symptoms produced on the plants

by the mites are chiefly whitish or greyish spots, generally close to the main veins at first. With large numbers of these mites attacking a plant, these spots may run together until the whole leaf takes on a whitened or silvery appearance. Where this happens with young seedling plants, the damage is frequently so serious that the young plants die.

Of the vegetable crops, lettuce, red-beet, silver-beet, carrots, turnips, spinach, potatoes, and cabbages are most severely attacked, while in the flower garden calendulas, stocks, and snapdragons are preferred. Of the field crops, lucerne, all clovers, and particularly young subterranean clover plants, and oats are commonly damaged.

Over-summering of this pest apparently occurs in the form of eggs which remain protected within the dead bodies of the parent mites. These hatch within seven to ten days of substantial autumn rains, and extensive feeding commences at once, usually during the early morning and late afternoon. During the day, large numbers of the mites are frequently observed clustered together on the soil or on portions of the leaves, and they disperse rapidly when disturbed. The adult mite measures roughly 1/25th of an inch in length, has a purplish-blue body with eight bright red legs.

Control

The first essential in the control of the pest is that seeds or seedlings must be grown on well-prepared ground, which should be kept as free from weeds for as long as possible before growing the plants. In this way, there will be less likelihood of a large population of mites building up to attack later plantings.

Leaf showing typical injury caused by mite.
[W.A. Dept. of Agric.

With vegetable or garden plants where mites are already present, any of the following mixtures will prove satisfactory :—

(*a*) White oil emulsion .. 1 pint
Nicotine sulphate .. 1 oz.
Water .. .. .. 5 gallons

This mixture should be sprayed on to the plants and the soil under the plants during the warmest periods of the day, and preferably on a fine, warmish day.

(*b*) Dust affected plants with one of the specially prepared pea-mite dusts on the market, containing both nicotine and creosote.

(*c*) For field crops, a mixture of one part of carbolic powder and 4 parts of superphosphate, or 4 parts of lime, will give excellent results when applied through a manure spreader at the rate of 1½ cwt. of the mixture per acre, particularly when applied about a fortnight after the autumn rains.

THE PEAR AND CHERRY SLUG

As the second brood of the Pear and Cherry Slug, *Caliroa limacina* Retz., is, at the present time, appearing on fruit trees, it is essential that control measures be exercised against this pest.

The damage is confined entirely to the leaves, the small " slugs " or grubs feeding on the surface layers and producing a skeletonizing effect, the network of veins alone remaining. In severe cases, every leaf of the tree may be affected, causing a considerable reduction in the vigor of the buds for next season's crop.

The fruit trees most affected are cherries, pears, quinces, and plums, while in the home garden such plants as Crataegus and Cotoneaster are frequently attacked.

The adult insect is a small, shiny black wasp, measuring roughly one-quarter of an inch in length, which may be seen, at odd times, resting on the surface of the leaves of the above-mentioned plants. The eggs are laid singly under the upper surface of the leaf inside small raised brownish blisters. They hatch in from ten to fourteen days into small greenish-black slimy " slugs," which, on becoming fully grown, measure roughly half an inch in length, turn black, and are rather broader at the head end than at the tail end. When feeding, which takes place only on the upper surface of the leaf, is completed, the slugs fall to the ground, bury themselves at a depth of

Quince leaf damaged by Pear and Cherry Slug.

2 to 4 inches, and pupate there. In the summer, this pupal stage lasts only two weeks, the adult insect emerging and commencing the life cycle over again. In Victoria, there are two generations of this insect every year.

Control

On trees from which the fruit has been picked, control is readily obtained by spraying with arsenate of lead, using 1 oz. of arsenate of lead powder or 2 oz. of arsenate of lead paste in 2 gallons of water. With pears and quinces, however, it is usually not necessary to take any special precautions, as the arsenate of lead sprays which should be used for the control of the codling moth will automatically control this pest. On trees such as cherries and plums, where serious infestations may occur before the fruit is picked, the spray or dust should be a nicotine preparation. If a spray is used, 1 oz. of nicotine sulphate should be mixed with 5 gallons of soapy water, while if a dust is the more convenient, a 3 per cent. nicotine dust, already prepared for use, is recommended.

FLEAS

During the summer and early autumn months, plagues of fleas regularly occur both in the suburban areas and in country districts. In the suburbs, they appear to be mainly restricted to sandy soil areas, being most commonly picked up in back-yard gardens and on lawns.

There are three distinct types of fleas commonly found in Victoria. They are the Dog Flea, *Ctenocephalides canis* Curt., the Cat Flea, *C. felis* Bch., and the Human Flea, *Pulex irritans* L., and of these three, the Dog Flea and the Cat Flea are the most frequently encountered.

Fleas are obnoxious not only on account of the discomfort caused by their bites, but also because they may transmit certain undersirable organisms and diseases to human beings. The effect of the bite of fleas on men varies greatly—usually there surrounds the puncture a reddish "pimple," which fades into the surrounding skin; in others, the area becomes pustular; while in others, no apparent symptoms appear.

It is important to know the life history of a flea in order that a full appreciation may be obtained of why certain control measures are necessary. The eggs of fleas, which are oval and pearly white in colour, measure roughly 1/50th of an inch in length. They are laid loosely in the hairs of the hosts (cats or dogs), and drop off very readily as the animal moves around. These eggs hatch in three or four days to small, elongated, worm-like, legless creatures, which live either on the soil or on the bedding material of the animals. Their food consists for the most part of dried blood and the excreta of other fleas, mixed with the dust in which they live. On reaching maturity, these larval fleas spin silken cocoons in which they pupate, finally emerging as typical, adult fleas. The length of the life cycle may vary from two weeks to several months, depending on environmental conditions.

An adult flea.

Control

As animals, such as cats and dogs, are usually the source of infestation, particular attention should be paid to ridding them of fleas. This may be done by washing dogs thoroughly in a 3 per cent. solution of creolin. This mixture is not recommended for cats, as cats so treated usually sicken because of their habit of licking their fur to dry themselves. Cats, therefore, should be thoroughly dusted, over sheets of

paper, with fresh pyrethrum or "insect powder," which stuns the fleas, causing them to fall off on the paper, which should then be collected and burnt.

Sheds, dog kennels, and other infested outbuildings should be thoroughly cleaned out, and sprayed with a red spraying oil at a strength of 1 in 40. For the treatment of the soil under buildings and sheds which are known to be infected, spraying with either creosote oil or the red oil mentioned above is recommended. In order to obtain a satisfactory clean-up in such positions, two applications of the mixture should be given, with a fortnight between applications.

Inside the house, if fleas have been brought in from outside, thoroughly spray all cracks and corners of the room, particularly the floor and carpet area, with one of the commercial liquid fly sprays.

The itching and irritation on human beings caused by the bites can be relieved by the use of lotions, such as carbolic acid 2 per cent., camphor, or menthol. Carbolized vaseline is also very satisfactory.

The Cross-Cut Saw—How to Carry

A cross-cut saw, like a shark, has a long row of teeth with which to inflict wounds, but, unlike the shark, it will not attack. The fellow who gets hurt by one can generally blame only himself.

The following suggestions should prove of help to you in the safe handling of a cross-cut saw :-

(1) When picking up saw or putting it down, always keep teeth pointed away from you.

(2) Carry it on your shoulder with the teeth pointing away from you, and, as you walk with it, keep an eye out for any one who might be close at hand. Remember, it is pretty close to the height of the other fellow's face.

(3) Keep arm straight from shoulder to keep saw in line of walk so you will know where the whole saw is.

(4) Keep clear of bushes, saplings, or other objects that might catch the saw, causing it to give you a blow on the neck or perhaps knocking it out of your control.

(5) Do not turn corners fast. Give others a chance to get out of the way of the swing of the saw.

(6) When finished with the saw, put it away on a rack, flat against the wall. The rack should be such that the saw cannot be knocked off. If no rack available, lay it down flat with teeth pointed away from approach side.

When using a crow-bar to roll logs, get a firm base which permits of leverage being safely exerted and roll logs away from you. Never work a log towards you—you may crush your feet or legs.

[Issued by the National Safety Council of Australia.

Help your Neighbour and don't be too proud to let him help you

FRUIT JUICES AND JELLIES

By RACHEL M. PEILE, Fruit Preserving Expert

JUICES

APART from their pleasing appearance and delightful flavour, fruit juices are of value in the diet on account of their vitamin content, the minerals they contain, and the fact that their reaction in the body is alkaline.

Unfortunately, colour, flavour, and vitamin content of most juices are gradually lost when juices are preserved by home methods and stored for any length of time. This loss depends on the temperature during pasteurization, and length of time stored. The addition of sugar to citrus and berry fruits retards these undesirable changes.

Fruits suitable for juice are—apples, pawpaws, passion fruit, berry fruits, prunes, pineapples, tomatoes, grapes, currants. It is interesting to note that black currant juice is being advocated for babies on account of its high vitamin content.

Juice can be expressed by a crusher or extractor for hard fruits like apples, quinces, or pineapples. Where dealing with large quantities of apples or grapes a press is used. A greater quantity of juice is obtained from berry fruits if they are heated over hot water until the juice runs freely, and then strained through a cloth. Citrus juice is extracted on a cone extractor, but it is not strained. Tomatoes are heated to boiling point, boiled fast for about ten minutes, then strained. Fruit juices should be put in glass, earthenware, or aluminium—*never in galvanized ware.*

Apple, grape, and tomato juice require no sugar, though salt may be added to the latter. For other fruits the amounts required are as shown—

Berry fruits—2 cups sugar to 3 cups juice.
Orange and grapefruit—1 cup sugar to 3 cups juice.
Lemons—1¼ cups sugar to 1 cup juice.
Plums—1 cup sugar to 2 cups juice.

The sugar should be dissolved before bottling.

Any glass bottle with a well-fitting cork may be used; crown top bottles are suitable if a crown sealer is available. The bottles should be quite clean, and the corks should be boiled in a saucepan with a lid on for ten minutes.

The bottles are filled to about 1½ inches from the top, and a funnel is useful for this purpose. The cork is placed on or tied down, and the bottles placed on a stand in a vessel for pasteurizing. A kerosene tin is useful, as the vessel should be high enough to hold the bottles. Water is poured in to reach up to the neck of the bottles and this water should be of about the same temperature as the juice when the bottles are placed in it. The lid is put on the vessel, and the temperature is raised to 165°F., and held between 165°F. and 180°F. for 35 minutes.

The bottles are then removed from the pasteurizer, their corks pressed in, and the heads of the bottles dipped in melted paraffin wax or sealing wax. They are placed on a damp cloth and allowed to cool. If crown seals are used, they may be clamped on about five minutes before removing from the pasteurizer. When cool the seals should be examined. If necessary the bottles should be re-dipped, and stored in a cool, dark place.

In serving juices and syrups they may be used in ices, trifles, milk shakes, sherbets, gelatine sweets, sundaes, or used as beverages.

Fruit Punch—

4 cups fruit juice
½ cup lemon juice
1 cup sugar (omit if juice is sweetened)
4 cups water.

Dissolve sugar in the water; add the fruit juices and mix. Cracked ice, orange or lemon slices, or sprigs of mint may be added when serving.

JELLIES

Jellies are made by extracting the fruit juice, and boiling with sugar until a jelly-like set is obtained. To obtain a good jelly the fruit should be "firm ripe."

To form a jelly pectin, acid and sugar are needed. The pectin is found in the fruit. "Firm ripe" fruit is richest in pectin. Acid also is found in the fruit, but extra acid in the form of lemon juice may be added.

Fruits suitable for jellies are:—Cooking apples, blackberries, green gooseberries, guavas, loganberries, melons, plums (dark), quinces,

raspberries, red and black currants, citrus fruits (these are generally used for marmalade), and grapes.

Jellies can be made from pineapples, pears, apricots, peaches, cherries, strawberries, only when combined with such fruit as apples, lemons, or loganberries.

To test for the finishing point of jelly, use one of the two methods given hereunder:—

Place a teaspoonful on a plate to cool. If it sets the jelly is done.

Dip in a spoon, turn it in the hand to let the jelly cool, then let it drip from the edge. If it breaks off in flakes the jelly is done. (The temperature will be about 219 to 223°F.)

When covering jellies, pour a thin film of melted paraffin wax on to the surface; cover with screw lid; paste over or put on a cellophane cover. Another method is to cut paper to fit the top of the jelly, dip in vinegar, place on the surface, and cover with lid, paper, or cellophane.

Spoiled Jellies.

Failure of jellies to set is caused by using unsuitable fruit; under-cooking, which gives a thin syrup; overcooking, which gives a thick, sticky syrup; or adding too much sugar.

Cloudy jelly is caused by not straining the juice properly; by allowing jelly to cool before bottling; or by using unsuitable fruit.

Fermented jelly and mouldy jelly are caused by yeasts and moulds. If jelly is bottled hot into hot jars and efficiently sealed, these faults should not occur.

FIRST METHOD.

Wash fruit, cut up roughly, using skins and cores. Barely cover with water, and cook gently with the lid on until the fruit is tender and the colour partly drawn. Strain through butter muslin, then flannel. Measure the strained juice and allow a cup of sugar to each cup of juice. Dissolve the sugar and boil rapidly with the lid off until the test is given. Bottle immediately into hot jars. Seal and label.

Jellies made by this method are as follow:—

Recipes.

Apple Jelly.—Use cooking apples, such as Stewart Seedling, Granny Smith, Gravenstein, Rokewood, or Five Crown.

Apple and Blackberry.—6 lb. blackberries, 3 lb. apples.

Apple and Mint.—2 lb. apples, 2 cups washed, crushed mint, 1 cup water, 3 cups white vinegar, 2 cloves and 8 peppercorns tied in muslin bag.

Apple and Pineapple.—2 lb. pineapple, 6 lb. apples, 3 pints water.

Apple and Peach.—3 lb. apples, 3 lb. peaches.

Apple and Plum.—3 lb. plums (under-ripe, dark), 3 lb. apples.

Apple Quince.—4 lb. apples, 4 lb. quinces, 6 pints water.

Apple and Raspberry.—4 lb. apples, 1 lb. raspberries. Cook apples to tender stage then add raspberries, boil 10 minutes.

Apple and Rhubarb.—3 lb. apples, 1 lb. rhubarb. Be careful not to remove the outer red skin from the rhubarb as this helps to give the colour.

Apple Jelly Spiced.—Use a mixture of 3 parts vinegar to 1 part of water to cover the fruit. After straining boil the liquid with cinnamon, cloves, and ginger for 15 minutes, strain, add ¾ cup sugar to each cup of liquid.

Crab Apple.—Proceed as for first method.

Grape Jelly.—6 lb. grapes (sour), 1 pint water.

Green Gooseberry.—Boil gooseberries till pink colour is obtained.

Guava Jelly.—4 lb. guavas, 2 pints water, juice of 2 lemons, strain lemon juice.

Loganberry Jelly.—6 lb. loganberries, 1 pint water.

Melon and Lemon.—5 lb. melon, 1 lb. lemons, 2 quarts water. Melon may be peeled.

Melon and Orange.—5 lb. melon, 1 lb. Poor-man orange, 2 quarts water.

Plum Jelly.—Suitable varieties are—Orleans, Satsuma, Angelina.

Quince Jelly.—Proceed as for first method, or leave quinces whole and cover with water. Cook very slowly till quite tender. The quinces may then be removed and served with cream and sugar, while the juice is made up as jelly.

Red Currant Jelly.—4 lb. red currants, 1 pint water.

SECOND METHOD.

This method is used for berry fruits. Crush the berries and heat without water to boiling point; cook gently for a few minutes until tender. Strain and continue as for first method.

Raspberry, loganberry, and blackberry jellies can also be made by this method.

Emergency Substitutes for Use in Jams, Pickles, and Relishes

By RACHEL M. PEILE, Fruit Preserving Expert

MANY housewives are finding it difficult to obtain certain ingredients—sugar, perhaps, being the most difficult of all. But it may interest many women to know that jams and marmalades, pickles, and chutneys may be made quite successfully with much less sugar, provided they are not put away to keep indefinitely. It is a good idea when making jam for keeping purposes to use the whole quantity of sugar, and only half quantity when the jam is to be kept for only a short time or for immediate consumption. When less sugar is used, the jam will require a little longer cooking before the sugar is added, and the jam or marmalade will result in a slightly smaller quantity, but the flavour and consistency will be quite satisfactory. For example, when making quince jam, the quinces should be barely covered with water and boiled gently for 1½ hours instead of for 1 hour.

If apples are boiled down with sufficient water to cover, strained, and boiled again to reduce them to half the quantity, this liquid may be used in place of part of the sugar in the recipe. It will help to sweeten and set the jam.

In addition to sugar some housewives are finding it difficult to obtain mustard, salt, and preserved ginger, while other commodities are scarce also. When pickles and chutneys are being made and preserved ginger is required, this may be replaced by ground ginger, using a much smaller quantity. Mustard seed, a substitute for mustard, now unobtainable in most grocers' shops, can be procured at most seed merchants'. Curry powder also may be used as a substitute for mustard, the quantities used being slightly less than for mustard. If the quantity in any recipe is small, it may be left out entirely, and the flavour will not be impaired.

As all our spices come from overseas they will be very difficult to procure. Therefore, whenever possible, substitutes must be found or the spices available used very sparingly. When making pickles, chutneys, and relishes it is well to remember that a little longer boiling will ensure greater safety in keeping when the amounts of spices and sugar are reduced.

When spices are difficult to obtain, it is suggested that herbs be used in their place. Sage, thyme, and marjoram, which are easily grown in the kitchen garden, although they will not quite take the place of many spices, will nevertheless give an excellent flavour, and several recipes are given where such herbs may be used. A recipe for cucumber relish, using curry powder, is given also.

When sugar is scarce and needed more for other things, it is a good idea to use half quantity sugar and half quantity raisins when making chutneys and relishes. These dried fruits contain large amounts of fruit sugar which will take the place of white sugar.

Quince Jam (less sugar used)—

2 lb. quinces.
1 lb. sugar.

Peel, core, and cut up quinces. Cover with water and cook gently for 1½ hours. Add the sugar, dissolve it, and boil until it sets—about three-quarters of an hour.

Cucumber Relish (apple cucumbers may be used)—

2 lb. cucumbers
½ lb. sugar.
4 small chillies.
¼ pint vinegar.
1 level teaspoon ground ginger.
½ teaspoon curry powder.

Peel cucumbers, and mince or chop finely. Place in a bowl, and sprinkle with a tablespoonful of salt. Cover with a plate, and allow to stand for 12 hours. Drain thoroughly; rinse and drain well. Boil all ingredients slowly for about half an hour. Bottle and seal.

Apple and Marrow Chutney (using herbs, raisins, and half quantity of sugar)—

2 lb. marrow.
1 lb. green apples.
¼ lb. raisins.
2 teaspoons sage.
¼ lb. sugar.
½ lb. onions.
1½ pints vinegar.
½ oz. peppercorns.
1 teaspoonful thyme.

The marrow should be peeled and cut into small pieces, then placed in a basin and sprinkled with two tablespoons of salt. It should be left to stand over-night, then drained well. The next day the apples and onions are chopped finely, the peppercorns tied in muslin, and all ingredients cooked until of a good consistency.

Apple Chutney (using herbs and less sugar)—

2 lb. cooking apples.
½ lb. sugar.
¾ pint of vinegar.
pinch cayenne.
2 teaspoons sage.
¾ lb. onions.
1 small dessertspoon salt.
½ lb. sultanas.
1 teaspoon marjoram.
1 teaspoon thyme.

Simmer all ingredients until of good colour and consistency, about 1½ hours.

Help your Neighbour - United We Stand - Divided We Fall

The Axe—How to Handle

(1) Take up an easy stance with a firm foothold, keeping the feet well apart, and guard against danger of slipping. Don't, for instance, stand on a slippery log to chop.

(2) Have a long grip on axe when swinging.

(3) Make sure you have plenty of room to swing, being careful to watch for overhead obstructions and also that no person is within striking distance. When tree-felling, clear away scrub around tree so that there is plenty of room to swing the axe and to allow you to dodge the falling tree.

(4) Carry axe with handle on your shoulder, having the head at the back of, and close to, the shoulder. The blade should be turned outwards and the handle held near the end.

(5) In passing an axe to another person, pass the handle first, keeping a firm grip on the head until sure the other person has a secure hold on it.

(6) Inspect handles regularly. See that axe is properly wedged to prevent head flying off.

(7) Keep axe sharp—it's less dangerous that way. Never leave an axe where someone may step on or strike against the edge. When finished with, hang axe on bracket from which it cannot fall, or put it in corner with head down and edge in.

(8) If you need to leave an axe in tree or stump, don't place it in a high position where, if knocked down, it may fall on some one.

After completing heavy work and your body is heated, put on a coat immediately so as to avoid chance of catching cold or a severe chill.

Don't neglect even the smallest cut or abrasion. Get treatment immediately.

[Issued by the National Safety Council of Australia.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	Longerenong Agricultural College	Dooen	43
Ballarat Orphanage ..	Ballarat	111	McNabb and Son, G. A.	Irrewillipe East ..	177
Banyule Stud Pty. Ltd.	Wangaratta ..	42	Northcote Children's Farm	Bacchus Marsh ..	156
Black, I. S., Estate ..	Mount Noorat ..	52	Onley, W. H. ..	"Glenholme," Caldermeade	50
Clarke, A. B. ..	Glenormiston South	16	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Dennis, Mrs. A. A. ..	Frankston ..	33	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dookie Agricultural College	Dookie	77	Poole, M. A. and D.	Caldermeade ..	134
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Poole, M. A. and D.	Yannathan ..	72
Geelong Grammar School	Corio	56	Powell, T. S. ..	"Carellen," Mansfield	46
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	29	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gorman, A. W. ..	"Cathcart," Alexandra	61	Samuel, Misses G. and E.	Lang Lang ..	48
Hollaway, R. W. ..	Caldermeade ..	72	School of Horticulture	Burnley	10
Kilmany Park Farm Home for Boys	Sale	94	State Experiment Farm	Rutherglen ..	40
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	State Research Farm	Werribee	229
			Wells, W. G. ..	Caldermeade ..	63

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Andison, J. A. ..	Thomastown ..	43	Child, G. P. ..	Epping	53
Andrew, J. C. ..	Whittlesea ..	121	Christian Bros. ..	Doreen	41
Andrew, W. ..	Whittlesea ..	160	Clark, P. W. ..	Whittlesea ..	62
Andrews, E. H. ..	Templestowe ..	19	Clements, M. and L., and Son	Bundoora ..	135
Balharrie, J. A. ..	Whittlesea North ..	59	Cobain, J.	Thomastown ..	48
Barclay, A. H. ..	Whittlesea ..	107	Collins, L.	Doreen	48
Barling, J. ..	Mernda	33	Cornfoot, D. H. ..	Whittlesea ..	25
Batten, R. J. ..	Wollert	44	Cotchin, J. ..	Woodstock ..	18
Bebbington, J. ..	Whittlesea ..	92	Coulthard, J. J. ..	Whittlesea ..	66
Benson, R. ..	South Morang ..	35	Craker, Mrs. E. ..	Warrandyte ..	2
Bodycoat, A. ..	Wollert	39	Cumming, H. R. ..	South Morang ..	23
Booth, Mrs. A. ..	Warrandyte ..	8	Cunningham, E. C. ..	Templestowe ..	23
Bourke, G. J. ..	Fairfield	82	Danaher, J. V. ..	Whittlesea ..	63
Bradbury, A. K. ..	Diamond Creek ..	50	Danns, N. C. ..	Whittlesea ..	34
Bunting, J. ..	Epping	35	Deutscher, H. W. ..	Mernda	168
Butler, W. ..	Wallan	49	Deveny, M. ..	Bundoora ..	51
Callaghan, L. ..	Epping	34	Draper, L. S. ..	Wollert	31
Callaghan, T. F. ..	Thomastown ..	40	Drysdale, J. C. ..	Warrandyte ..	41
Carr, W. J. ..	Wollert	65			

Name.	Address.	Number in Herd at Last Test.
Fellows Bros.	West Heidelberg	52
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Fox, A.	Mernda	59
French, T. W.	Wollert	43
French, W.	Greenvale	51
Galbraith and Walker	Greensborough	36
Gamble Bros.	Greenvale	156
Gallus, E. A.	Doncaster	14
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	28
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	27
Harding, J. E.	Templestowe	42
Hargreave, Mrs. E. J.	Whittlesea	21
Harkness, H. J.	South Morang	31
Harmer, R. E.	Wollert	38
Hawkes, Miss D.	Warrandyte	21
Hehr, H.	Epping	32
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howden, A.	Epping	29
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	11
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	28
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McDonald, A. J.	Whittlesea	2
McDowell, R. H.	Greensborough	28
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Mason, N.	Donnybrook	52
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	6
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	44
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
Norton, O. G.	Bundoora	37
O'Hern, T.	Epping	58
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Patullo, F. E.	Mickleham	36
Pitson, R. H.	Yarrambat	17
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	49
Rawlings, J. H.	Whittlesea North	41
Righetti, L. A.	Lower Templestowe	40
Rodgers, E.	Whittlesea North	11
Rosewarne, Miss P.	Yan Yean	43
Seeber, B.	Thomastown	24
Shanks, John	Mernda	73
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Simpson, W. G.	Donnybrook	12
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	81
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	31
Southon, H. W.	South Morang	60
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Thomas, Mrs. E.	Broadmeadows	11
Thomas, W. C.	Yan Yean	31
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Vallence, C. A.	Epping	11
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	17
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	33
Williamson, J.	Doncaster (High-street)	4
Willis Bros.	Craigieburn	61
Wilson, J. E.	Diamond Creek	9
Wilson, Mrs. M.	South Morang	14
Wood, A. V.	Yan Yean	125
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Young, Mrs. A.	Wollert	33
Ziebell, H.	Thomastown	32

There are also 460 herds in which 13,369 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

Standard Herd Records

For Quarter ended 31st December, 1942

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 285, of which 206 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow (5 years and over)	350 lb. butter-fat.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn, (6).										
Willow Park Camelia 28th	1502C	273	17½	8,252	3·00	247·7	310	Jr. 4	343 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 41st	1525C	273	18	9,219	3·19	294·2	270	Jr.3	313 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 9th	1330E	273	42	12,879	3·42	440·1	350	Mature	414, 515, 558, 539, 439, 474	Willow Park Reflector
Willow Park Moss Rose 20th	1695D	240	4	6,952	2·89	201·1	270	Jr. 3	250 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Queenie 43rd	1534C	273	33½	11,655	3·46	403·3	310	Jr. 4	370, 403 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Rosebud 2nd	1448A	273	21	7,206	3·92	282·2	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Ballarat Orphanage, Ballarat, Jersey (6).										
Banyule Silvermine 58th ..	29032	273	22	6,285	5·65	355·1	350	Mature	308, 435, 383, 388, 440, 425	Superstrain of Banyule
Orphanage Attraction 15th	C.R.	273	20	7,570	5·45	412·8	290	Sr. 3	.. ..	Banyule Terraplane
Orphanage Doris 5th ..	68457	273	16	7,325	5·37	393·7	350	Mature	255, 283, 475	Jerseylea Quality Boy
Orphanage Quicksand 13th	73308	273	19	6,732	5·72	385·1	350	Mature	275, 406,447	Retford King Bracken
Orphanage Soprano ..	Vol. 29	273	22	6,329	4·78	302·8	230	Jr. 2	.. ..	Clarendon Eyre Lillilte's Oxford 4th
Orphanage Zaffarine 14th	Vol. 29	273	14	6,314	5·56	351·1	230	Jr. 2	.. ..	Banyule Terraplane
Banyule Pty. Ltd., Wangaratta, Jersey (6).										
Banyule Clytie	70184	273	21½	7,470	5·69	425·3	250	Sr. 2	338 ..	Banyule Triplane
Banyule Silvermine 108th	56264	273	19½	8,300	5·14	426·4	350	Mature	369, 411, 551	Banyule Triplane
Banyule Silvermine 119th	60504	273	23	7,470	5·66	422·9	310	Jr. 4	398, 396 ..	Banyule Triplane
Banyule Silvermine 135th	75074	273	24	6,687	5·94	397·5	230	Jr. 2	.. ..	Banyule Monoplane
Rowallan Attraction ..	69020	273	25	8,448	5·24	442·9	310	Jr. 4	317 ..	Banyule Oxford Don
Rowallan Silvermine 5th ..	64129	273	21½	7,943	5·65	449·0	310	Jr. 4	289, 430 ..	Banyule Oxford Don
Barkla, R. E., and Sons, Joyce's Creek, Jersey (1).										
Green Gully Dawn ..	Vol. 30	273	13	3,426	5·46	187·0	230	Jr. 2	.. ..	Orphanage Major
Bennett, J. W., Yinnar, Jersey (5).										
Ellendale Bluebell 5th ..	47970	273	N.C.K.	7,317	5·70	417·4	350	Mature	317, 414 ..	Mistletoe 2nd's Treasure Lyning
Ellendale Cloudy 7th ..	76080	273	N.C.K.	8,220	5·66	464·9	290	Sr. 3	415 ..	Staghorn Bellboy
Ellendale Duchess 2nd ..	61417	273	N.C.K.	9,271	4·67	432·5	250	Mature	.. ..	Staghorn Bellboy
Ellendale Kirsty 26th ..	66336	273	N.C.K.	9,243	5·26	486·1	350	Mature	378, 581 ..	Staghorn Bellboy
Ellendale Romany 7th ..	61421	273	N.C.K.	8,472	4·75	402·3	350	Mature	415 ..	Staghorn Bellboy
Bott, J., Yarrawonga, Red Poll (4).										
Flowing Vale Planet ..	6844A	273	24	7,904	3·58	283·0	350	Mature	.. ..	Glenora Artist
Naranghi Dawdle ..	7494AA	273	22	6,556	4·07	266·9	250	Sr. 2	.. ..	Bundure Windsor
Naranghi Merline ..	5055B	273	12	6,621	4·08	270·4	350	Mature	.. ..	Naranghi Wisdom
St. Cloud Paradise ..	6700AA	273	21	7,115	4·21	299·3	310	Jr. 4	.. ..	Sydney General (Imp.)
Broad, Mrs. A. A., Sutton Grange, Jersey (3).										
Grangelea Rebel	71630	273	35	8,040	5·86	470·8	270	Jr. 3	309 ..	Grangelea Daffodil's Airo
Grangelea Rosebud 10th ..	66768	273	20	5,477	5·75	314·8	290	Sr. 3	251, 333 ..	Grangelea Daffodil's Airo
Grangelea Ruby 3rd ..	66766	273	19	5,292	5·51	291·4	310	Jr. 4	328, 344 ..	Grangelea Cream Boy

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Broad, A. J., Pyramid, Jersey (1).										
Lynlea Rose Petal 2nd ..	77487	240	4	3,202	5·47	175·0	290	Sr. 3	286 ..	Grangelea Prosper 5th
Butcher, F. T., Swan Hill, Red Poll (1).										
Maryville Fancy	7863A	273	15	5,742	3·94	226·1	230	Jr. 2	.. ..	Victoria Generator B
Carne, W. J., Pakenham Upper, Jersey (1).										
Navuloa Master's Ladybird.	63365	273	27½	8,070	5·52	453·8	350	Mature	383, 435 ..	Werribee Grandmaster
Chirnside, R. M., Whittlesea, Jersey (2).										
Mornmoot Golden Cream 2nd	77851	273	12½	5,288	5·41	285·9	230	Jr. 2	.. ..	War Valour (Imp.)
Mornmoot Princess Madeira	37071	273	32	9,008	5·43	489·1	350	Mature	424, 572, 773, 794, 794, 520, 553, 514, 524	Werribee Grandmaster
Clarke, F. W., Toora, Jersey (2).										
Mer Vue Choice Variety 2nd	Vol. 29	273	N.C.K.	5,187	7·07	366·5	230	Jr. 2	.. ..	Mer Vue Jupiter
Mer Vue Joy	63049	273	N.C.K.	6,794	6·37	432·5	350	Mature	522, 597, 442, 524	Flashlight of Woorayl
Clark, P. W., and Son, Whittlesea Jersey (2).										
Coodardy Centurion's Jean	75739	273	31½	10,025	4·44	445·1	310	Jr. 4	372 ..	Werribee Centurion
Coodardy Lady	C.R.	273	19	6,566	5·34	350·3	230	Jr. 2	.. ..	Brucevale Lord Rupert
Colenso, L. W. R., Alvie, Jersey (3).										
Normandie Ilma 3rd ..	45472	273	35	10,635	5·74	610·6	350	Mature	241, 376, 366, 387, 460, 590	Peer of Lewisham
Normandie Ilma 5th ..	58746	273	37	9,548	4·73	451·9	350	Mature	227, 265, 478	Normandie Majestic
Normandie Thelma 5th ..	58749	273	26	9,785	5·49	537·4	350	Mature	181, 169, 452, 437	Normandie Majestic
Cook, D. E., Loch, Jersey (1).										
Wattle Vale Bloom ..	64840	240	4	2,677	6·65	177·9	350	Mature	397 ..	Ewelme Eileen's Northerner
Coulthard, J. J., Whittlesea, Jersey (6).										
Elmwood Gay Beauty 14th	C.R.	273	17	4,857	5·24	254·5	230	Jr. 2	.. ..	Elmwood Merry Boy
Walamba Bessie	Vol. 29	273	8½	3,581	5·24	187·7	230	Jr. 2	.. ..	Clarendon Eyre Brigadier 3rd
Walamba Lady	64779	273	17½	7,131	5·82	415·3	350	Mature	294, 274, 336, 422, 277, 345	Banyule Airo
Walamba Lily	Vol. 29	273	18½	5,414	5·31	287·7	250	Sr. 2	227 ..	Clarendon Eyre Brigadier 3rd
Walamba Patsy	Vol. 29	273	12	4,512	6·46	291·7	270	Jr. 3	310 ..	Selsey Wonderful Boy
Walamba Precious Jewel ..	C.R.	273	10	4,133	5·27	217·7	230	Jr. 2	.. ..	Airlie Don
Cowan, G. L. S., Bacchus Marsh, Friesian (1).										
Ingolston Black Nose ..	4708	273	35	12,606	3·75	473·2	350	Mature	461 ..	Cordyline Cremona Pontiac
Cuddihy, T. D., Geelong, Jersey (2).										
Mount Violet Colleema ..	68125	273	20	6,350	4·91	312·1	350	Mature	386 ..	Mount Violet Count Twylish
Mount Violet Colletto ..	72072	273	17	5,680	5·16	293·2	290	Sr. 3	344 ..	Woodside Silver Count
De La Rue, N. C., Weering, Jersey (2).										
Balcairn Madeira ..	70124	273	4½	6,464	6·18	399·4	330	Sr. 4	354, 340 ..	Selsey Brampton Boy
Lucerne Vale Madeira 3rd	49243	273	23	8,305	5·24	435·4	350	Mature	283, 335, 441, 546, 410, 521	Lucerne Vale Grandmaster
Dennis, Mrs. A. A., Frankston, Jersey (2).										
Ballam Bridget	74999	273	19	5,702	6·05	344·7	230	Jr. 2	.. ..	The Wattles Gamboge Prince
Ballam Empress	75000	273	21½	6,303	5·06	318·9	230	Jr. 2	.. ..	The Wattles Gamboge Prince
Department of Agriculture, Werribee, Friesian (4).										
Victoria Astrea	Vol. 15	210	N.C.K.	2,910	3·59	104·6	230	Jr. 2	.. ..	Victoria Conductor
Victoria Ilkabelle ..	6087	240	N.C.K.	8,295	3·56	295·5	350	Mature	384, 429, 522, 405	Victoria Double Top
Victoria Madeline ..	Vol. 15	273	N.C.K.	9,158	3·56	325·9	230	Jr. 2	.. ..	Victoria Conductor
Victoria Sonorous Piebe ..	4289	273	N.C.K.	16,707	3·32	555·2	350	Mature	441, 418, 491, 583, 493, 493	Victoria Topnote

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Department of Agriculture, Werribee, Red Poll (11).										
Victoria Bessie	7009A	273	N.C.K.	8,109	3·49	282·8	350	Mature	316, 339, 450	Woodburn Peter Pan
Victoria Bluebird ..	Vol. 12	273	N.C.K.	7,820	4·98	389·3	270	Jr. 3	340 ..	Woodburn Peter Pan
Victoria Bull's Eye ..	C.R.	180	N.C.K.	2,835	4·66	132·2	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Decrect	3902AA	273	N.C.K.	6,189	4·16	257·4	350	Mature	253, 284, 327, 347, 403	Victoria Iraq
Victoria Forelady ..	Vol. 12	273	N.C.K.	6,449	4·09	263·6	230	Jr. 2	.. ..	Burwood Masterpiece
Victoria Lock	Vol. 12	273	N.C.K.	6,398	4·51	288·6	250	Sr. 2	.. ..	Victoria Petrology
Victoria Marsupalia ..	3916A	273	N.C.K.	8,208	4·85	398·0	350	Mature	290, 429, 466, 426	Dominion Bright Belgian
Victoria Nike	7017A	273	N.C.K.	7,604	4·02	306·0	350	Mature	.. ..	Victoria Gallant
Victoria Sphere	Vol. 12	273	N.C.K.	4,379	4·55	199·2	230	Jr. 2	.. ..	Victoria Petrology
Victoria Stiletto	7972A	273	N.C.K.	4,221	5·43	229·1	290	Sr. 3	300 ..	Woodburn Peter Pan
Victoria Vitabrit ..	Vol. 12	273	N.C.K.	6,567	3·78	248·0	250	Sr. 2	.. ..	Victoria Petrology
Desmond, J. J., Rochester, Jersey (1).										
Macroom Lovelies 3rd ..	Vol. 29	273	12	4,703	5·06	237·8	230	Jr. 2	.. ..	Clifford Farm V.C's. Skipper
Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (3).										
Belgonia Eileen 9th ..	70228	273	N.C.K.	7,286	5·46	398·0	310	Jr. 4	302 ..	Aim High (Imp.)
Karrara Perree's Music ..	77083	273	N.C.K.	7,029	6·24	438·7	290	Sr. 3	426 ..	Springhurst Perree's Quality
Karrara Tecoma's Eve ..	77092	273	N.C.K.	6,141	6·28	385·8	290	Sr. 3	375 ..	Karrara Christmas Eve
Dookie Agricultural College, Dookie, Ayrshire (2).										
Dookie Adorable ..	Vol. 35	273	19	6,297	4·36	274·6	230	Jr. 2	.. ..	Gowrie Park Bonnie Sailor
Dookie Lila	30382	273	13	6,459	3·78	244·1	350	Mature	324, 330, 338	Tregorland Indispensible
Dunmore, T. J., Melton, Jersey (2).										
Laura Dell Beth ..	72359	273	17½	5,621	6·59	370·7	290	Sr. 3	304 ..	Avalon Gladstar 34th
Laura Dell Petal ..	72362	273	18½	7,002	4·52	316·8	330	Sr. 4	279 ..	Brampton Pioneer Chut. (Imp.)
Eltringham, W. B., Lilydale, Jersey (3).										
Beverleybank Princess Marilyn	Vol. 29	273	17	5,543	5·99	331·8	230	Jr. 2	.. ..	Clifford Farm Lucky Boy
Clifford Farm Diana ..	70726	273	31	10,076	4·94	497·8	330	Sr. 4	429, 460 ..	Clifford Farm Danny Boy
Clifford Farm Pussy Willow	65360	273	31	10,407	5·03	523·8	330	Sr. 4	359, 506 ..	Clifford Farm Danny Boy
Everist, F. R., Tyabb, Red Poll (1).										
Chota Wallah Lady Ann ..	7679A	273	N.C.K.	5,715	4·29	245·3	250	Sr. 2	160 ..	Blackwood Mopoke
Fairchild and Clutterbuck, Tinamba, Jersey (2).										
Fairbank Queenie 3rd ..	61572	273	N.C.K.	5,915	5·52	326·8	350	Mature	276, 343, 250	Fairbank Chorus
Vaucluse Trilby	69525	273	N.C.K.	6,811	5·77	393·1	350	Mature	326, 442, 452	Glen Iris Violin
Fixter, A., Boisdale, Guernsey (3).										
Avonview Buttercup 2nd ..	6725	273	20	6,915	5·37	371·2	350	Mature	325, 290, 344	Kentdale Monogram
Avonview Dulcie 3rd ..	3964	273	25	8,885	5·35	475·0	350	Mature	370, 419, 469, 502	Avonview Golden Lord
Avonview Royal Lady ..	8278	273	23	7,259	5·61	407·0	230	Jr. 2	.. ..	Vermont Camilla's Sunrise
Gay, R. G., and Son, Yarram, Jersey (3).										
Elm Grove Noble's Silverbelle	76116	273	18	6,415	5·40	346·7	290	Sr. 3	296 ..	Staghorn Clementine's Noble 3rd
Elm Grove Silvermine ..	39643	273	34	9,707	5·68	551·3	350	Mature	310, 426, 414, 498, 288, 593, 636	Warenda Ragtime Dominant
Elm Grove Songstress ..	76120	273	28	8,913	5·43	484·3	270	Jr. 3	334 ..	Gold Star of Melrose
Goddard, J. H., Cora Lynn, Ayrshire (1).										
Inverurie Countess ..	33745	273	N.C.K.	10,122	5·05	511·4	270	Jr. 3	500 ..	Strathavon Farm Boy
Grice, C. S., Somerville, Jersey (2).										
Glenoma Heroine ..	76448	273	14	5,299	6·44	341·5	250	Sr. 2	314 ..	Clarendon Eyre Eminent's Barrister 9th
Glenoma Suspense ..	76449	273	14	4,244	6·57	278·9	230	Jr. 2	.. ..	Aim High (Imp.)
Handbury, J. E., and Son, Toora, Jersey (1).										
Tooravale Princess 36th ..	79278	273	N.C.K.	5,487	6·75	370·4	270	Jr. 3	388 ..	Tooravale Noble
Hardie, R., Lardner, Jersey (2).										
Glen Urquart Silver Queen 3rd	61714	273	15½	6,210	5·70	354·6	350	Mature	.. ..	Kooreena Defiance
Ovalau Masterpiece's Cream	73320	273	31½	8,750	5·51	482·4	310	Jr. 4	333, 436 ..	Staghorn Laburnum's Masterpiece

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Harvey, T., Boisdale, Jersey (8).										
Jerseyholm Bluebell 33rd ..	62305	273	N.C.K.	5,705	4·97	283·8	350	Mature	255, 297, 302	Jerseyholm Master's Fox 35th
Jerseyholm Bluebell 34th ..	62306	273	N.C.K.	6,389	5·57	355·8	350	Mature	300, 353, 351	Mornmoot Mars
Jerseyholm Bluebell 54th ..	71967	273	N.C.K.	5,610	5·29	297·0	230	Jr. 2	.. ..	Mornmoot Memnon 2nd
Jerseyholm Empress 70th ..	71974	273	N.C.K.	4,578	4·71	215·6	230	Jr. 2	.. ..	Mornmoot Memnon 2nd
Jerseyholm Empress 73rd ..	76959	273	N.C.K.	5,929	4·71	279·1	230	Jr. 2	.. ..	Mornmoot Memnon 2nd
Jerseyholm Kirsty 41st ..	71977	273	N.C.K.	5,120	5·47	280·3	230	Jr. 2	.. ..	Mornmoot Memnon 2nd
Jerseyholm Lady Marge 17th	67197	273	N.C.K.	4,595	5·45	250·2	310	Jr. 4	278, 131 ..	Rowallan Silvanite
Jerseyholm Lady Marge 19th	71979	273	N.C.K.	5,654	5·64	318·9	270	Jr. 3	288 ..	Orphanage Molly's Commander
Higgins, J. A. A., Keysborough, Guernsey (3).										
Brighton Vale Matilda ..	8372	273	22½	6,429	4·65	298·7	230	Jr. 2	.. ..	Melbourne Golden Boy
Brighton Vale Sunshine ..	8373	273	18	6,255	5·29	331·1	230	Jr. 2	.. ..	Melbourne Alain d'Or
Kentdale Myrtle	5631	273	16	5,925	5·05	299·0	350	Mature	243 ..	Kentdale Tomboy
Hodgins, G. E., Hastings, Jersey (4).										
Arlington Starbright ..	74888	273	7½	4,688	5·65	264·7	250	Sr. 2	258 ..	War Valour (Imp.)
Verjean Vesta 2nd ..	Vol. 29	273	15	4,863	5·52	268·4	230	Jr. 2	.. ..	St. John's Letetia 10th's Chut
Verjean Virginia 3rd ..	C.R.	273	21	5,604	5·55	311·0	230	Jr. 2	.. ..	St. John's Letetia 10th's Chut
Verjean Vontorson ..	74369	273	19	6,042	5·54	334·5	270	Jr. 3	341 ..	Jorian Great Boy
Hore, M. T., Horfield, Friesian (4).										
Elmar Fashion	Vol. 15	273	N.C.K.	7,947	3·15	250·5	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Lupin	C.R.	273	N.C.K.	8,701	3·02	262·5	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Rock Keyes ..	C.R.	273	N.C.K.	11,751	3·73	438·6	330	Sr. 4	340, 339 ..	Burnbank Iona Rock
Kurrajong Multi Majoe 5th	Vol. 15	273	N.C.K.	7,817	3·01	235·2	250	Sr. 2	.. ..	Elmar Majoe Galatea
Hurrey, Estate of the late W. H., Koonwarra, Jersey (6).										
Burwood Cream Belle 4th	60927	273	21	4,893	5·65	276·3	350	Mature	273, 338, 385, 365	Kooreena Handsome Lad
Kooreena Audrey 16th ..	77242	273	19½	5,324	5·73	305·1	270	Jr. 3	264 ..	Kooreena Rover 3rd
Kooreena Carrie 8th ..	62625	273	25	7,320	5·74	420·4	350	Mature	345, 444, 386	Kooreena Mourier's King 2nd
Kooreena Carrie 12th ..	C.R.	273	20	5,715	5·73	327·6	270	Jr. 3	.. ..	Kooreena Carrie 4th's Laddie
Kooreena Lady 7th ..	62627	273	22½	7,673	5·10	391·3	350	Mature	391, 394, 321, 409	Kooreena Carrie 3rd's Halo
Kooreena Lady 13th ..	C.R.	273	6½	4,070	5·49	223·4	270	Jr. 3	240 ..	Kooreena Carrie 4th's Laddie
Jackson, H., Lockington, Jersey (1).										
Pine Ridge Countess 3rd ..	68642	273	28	10,157	5·41	549·6	350	Mature	358, 448 ..	Duke of the Lake (Imp.)
Jeffreson, E. L., Narre Warren, Jersey (2).										
Barrowby Briar Rose ..	60508	273	12	5,804	4·98	288·8	350	Mature	303, 424, 411, 292	Barrowby Sonny
Finchley Lady Peerless 4th	71318	240	4	2,295	5·99	137·4	310	Jr. 4	187 ..	Finchley Masterman 2nd
Johnson, F. G., Horsham, Jersey (1)										
Thurso Treasure	69336	273	13	6,201	5·56	345·0	350	Mature	.. ..	Thurso Pretty Oxford
Linke, H. P., Tarrington, Dairy Shorthorn (1).										
Corresdean Topsy ..	17990	273	32	7,547	4·11	310·2	350	Mature	286 ..	Willow Park Revenue 2nd
Longerenong Agricultural College, Dooen, Ayrshire (1).										
Longerenong Acacia Elata 5th	30753	240	4	3,555	3·90	138·8	330	Sr. 4	285, 277 ..	Dookie Punch
Lyon, W. H., Sale, Jersey (7).										
Avon Berris	Vol. 29	273	N.C.K.	5,828	6·00	349·7	230	Jr. 2	.. ..	Avon Bandolier
Avon Blossom	65242	273	N.C.K.	6,396	5·69	363·8	350	Mature	367 ..	Ruby's Beau (Imp.)
Avon Canary	C.R.	273	N.C.K.	7,515	5·55	417·0	230	Jr. 2	.. ..	Studleigh Lord Madeira
Avon Love Song ..	Vol. 29	273	N.C.K.	5,173	5·91	305·7	230	Jr. 2	.. ..	Ruby's Beau (Imp.)
Avon Marlene	C.R.	273	N.C.K.	6,842	5·42	370·9	230	Jr. 2	.. ..	Studeigh Lord Madeira
Avon Nancy	C.R.	240	N.C.K.	3,435	6·30	216·5	230	Jr. 2	.. ..	Ruby's Beau (Imp.)
Avon Princess Donna ..	74955	273	N.C.K.	6,211	6·45	400·6	270	Jr. 3	270 ..	Ruby's Beau (Imp.)
Macauley, C. W., Rochester, Jersey (1).										
Taranah Chime 2nd ..	74081	273	16	6,110	5·84	356·9	310	Jr. 4	288, 324 ..	Taranah Reliance
McCormack, M., and Sons, Mansfield, Red Poll (1).										
Cypress Judith	3110B	273	N.C.K.	10,033	3·88	424·2	350	Mature	356 ..	Woodburn Glennie
McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (1).										
Spring Valley Sally 2nd ..	Vol. 29	273	12½	4,363	5·61	244·6	230	Jr. 2	.. ..	Selsey Gay Prince

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	(Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
McNabb, G. A., and Son, Irrewillipe East, Jersey (15).										
Avalon Starbright's Pansy 9th	70069	273	N.C.K.	5,580	6·18	344·9	290	Sr. 3	276, 388 ..	Avalon Starbright 8th
Greenwood Pet 2nd ..	71668	273	N.C.K.	7,230	5·10	368·7	290	Sr. 3	316 ..	Greenwood Geoff
Karoola Valerie	72114	273	N.C.K.	5,811	5·93	344·4	290	Sr. 3	389 ..	Glenvalley Royal Master
Maxon Bright Alsyke 3rd ..	72711	240 (Sold)	..	7,140	4·48	320·2	290	Sr. 3	296 ..	Maxon Starbright's Prince 5th
Maxon Bright Daisy 4th ..	72712	273	N.C.K.	5,712	5·78	330·2	290	Sr. 3	309 ..	Maxon Starbright's Prince 5th
Maxon Bright Favourite 2nd	58343	210 (Sold)	..	5,850	5·35	313·0	350	Mature	270, 331, 394, 417	Maxon Starbright's Prince 5th
Maxon Countess Light ..	49425	273	N.C.K.	9,432	5·32	501·6	350	Mature	331, 390, 427, 372, 735, 556	Maxon Count Graceful
Maxon Count's Daisy 3rd..	58349	273	N.C.K.	6,552	6·36	416·4	350	Mature	284, 298, 353, 476	Maxon Count Graceful
Maxon Count's Ranuculus	58352	210 (Sold)	..	5,370	4·96	266·1	350	Mature	321, 360, 423, 398, 423	Maxon Count Graceful
Maxon Handsome Alsyke	77623	273	N.C.K.	4,521	6·85	309·6	250	Sr. 2	285 ..	Maxon Handsome Boy
Maxon Handsome Estelle ..	77628	273	N.C.K.	5,270	6·09	321·0	250	Sr. 2	245 ..	Maxon Handsome Boy
Maxon Linnacre's Daisy ..	63004	273	N.CK.	6,420	5·30	340·4	350	Mature	202, 374, 357	Maxon Linnacre's Starbright 2nd
Maxon Noble's Bell ..	67853	210 (Sold)	..	5,055	5·99	302·6	350	Mature	302, 355, 355	Maxon Duchess Noble
Maxon Starbright's Pansy	77633	273	N.C.K.	5,499	5·96	327·5	250	Sr. 2	305 ..	Avalon Starbright 8th
Mornmoot Lady Starbright 2nd	68091	273	N.C.K.	6,702	5·63	377·4	270	Jr. 3	353 ..	Werribee Viceroy
Maher, R. H., Tongala, Jersey (2).										
Rosemont Lady Fowler 14th	64057	273	N.C.K.	6,921	4·39	303·5	350	Mature	266, 373 ..	Rosemont Golden Emblem
Rosemont Lady Fowler 36th	Vol. 29	273	N.C.K.	3,063	5·99	183·5	230	Jr. 2	.. ..	Belgonia Perree
Maloney, P. J., Tongala, Jersey (1).										
Belgonia Peggy 20th ..	70243	273	N.C.K.	8,546	5·51	471·2	310	Jr. 4	425, 355 ..	Aim High (Imp.)
Manly, R. A. A., Somerville, Dairy Shorthorn (1).										
River Glen Clarabelle 7th..	1983E	273	20	8,796	3·88	341·7	350	Mature	361 ..	Dorrie's Royal of Wangarra
Meaklim Bros., Moorroopna, Dairy Shorthorn (6).										
Drumneil Beauty ..	761E	273	N.C.K.	9,875	4·16	411·0	350	Mature	474, 448 ..	Willow Park Reformer
Drumneil Daisy 3rd ..	1835E	273	N.C.K.	9,956	3·54	352·9	350	Mature	320, 323 ..	Willow Park Lustre 3rd
Drumneil Dinah	1838E	273	22½	8,078	3·50	282·6	270	Jr. 3	254 ..	Willow Park Lustre 3rd
Drumneil Ida	1843E	273	N.C.K.	7,263	3·92	284·4	330	Sr. 4	365, 346 ..	Willow Park Lustre 3rd
Drumneil Nellie 3rd ..	779E	273	N.C.K.	10,781	3·66	394·9	350	Mature	328, 453, 367, 454, 353, 417	Willow Park Reformer
Drummeil Princess 6th ..	1853E	273	N.C.K.	8,639	3·95	341·1	350	Mature	325, 227 ..	Willow Park Lustre 3rd
Methodist Central Mission, Lilydale, Guernsey (3).										
Melbourne Golden Waterlily	7428	273	20	8,042	4·77	383·6	290	Sr. 3	243, 302 ..	Nundorah Daredevil
Melbourne Lucille ..	7445	273	18	8,306	4·58	380·3	310	Jr. 4	192, 263 ..	Yarraview Sequel's Slogan
Tally Ho Golden Locks ..	Vol. 14	273	24	6,252	4·56	285·1	230	Jr. 2	.. ..	Yarraview Fakia
Mitchell, R. H., Linton, Jersey (4).										
Clifford Farm Lotus ..	Vol. 29	273	31	8,800	5·44	478·6	230	Jr. 2	.. ..	Tavistock Quality Lad
Clifford Farm Mavis ..	Vol. 29	273	25	6,630	5·40	358·2	230	Jr. 2	.. ..	Clifford Farm Lucky Boy
Clifford Farm Nina ..	70729	273	22	7,397	5·89	435·7	290	Sr.3	373 ..	Clifford Farm Flashlight
Clifford Farm Rita ..	75663	273	22½	7,731	6·23	481·9	250	Sr. 2	.. ..	Clifford Farm Skipper
Moore, J., and Co., Yarram, Jersey (9).										
Clarendon Eyre Camille 11th	56799	273	N.C.K.	7,847	5·32	417·1	350	Mature	293, 336, 477, 239, 279	Victorious Pioneer (Imp.)
Clarendon Eyre Camille 12th	70723	273	N.C.K.	4,523	4·65	210·1	350	Mature	204, 208, 223	Clarendon Eyre Oxford Gamboge 2nd
Carendon Eyre Rose Marie 12th	56810	240	..	4,095	4·76	194·9	350	Mature	254, 229, 247, 148	Clarendon Eyre Oxford Gamboge
Tooloonook Camille 3rd ..	Vol. 29	273	N.C.K.	6,652	5·09	338·3	230	Jr. 2	.. ..	Belgonia Junette 2nd's Design
Tooloonook Molly 12th ..	59758	273	N.C.K.	6,152	4·86	299·0	350	Mature	256, 241, 322, 280, 240	Anfield Diadem's Masterpiece
Tooloonook Molly 16th ..	69398	240	..	2,985	5·82	173·7	350	Mature	267, 203, 260	Latrobe Musician
Tooloonook Peach 12th ..	79254	273	N.C.K.	6,392	5·82	371·8	310	Jr. 4	193, 217 ..	Belgonia Lady's Duke
Tooloonook Peach 16th ..	Vol. 29	273	N.C.K.	5,364	4·42	237·2	270	Jr. 3	172 ..	Belgonia Lady's Duke
Tooloonook Plumbago 9th	74212	273	N.C.K.	6,650	6·05	402·2	350	Mature	276, 305 ..	Latrobe Musician
Nancarrow Bros., Kerang, Jersey (3).										
Pine Ridge Design's Buttercup	68643	210	4	4,410	5·62	247·9	310	Jr. 4	316, 335 ..	Aim High (Imp.)
Pine Ridge Rose Dream 3rd	73502	273	N.C.K.	8,030	5·08	407·7	270	Jr. 3	365 ..	Belgonia Peggy 9th's King
Pine Ridge Rose Dream 4th	78465	273	N.C.K.	5,526	6·06	334·8	230	Jr. 2	.. ..	Aim High (Imp.)

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Nicholson, A. N., Moorooduc, Illawarra Shorthorn (6).										
Veresdale Cherry 2nd ..	Vol. 8	273	N.C.K.	7,301	3·89	284·2	250	Sr. 2	.. ..	Ovensdale Pearl's Renown
Veresdale Dahlia ..	Vol. 8	273	N.C.K.	6,606	4·19	276·7	250	Sr. 2	.. ..	Ovensdale Pearl's Renown
Veresdale Heath	Vol. 8	273	N.C.K.	7,701	3·25	250·0	230	Jr. 2	.. ..	Ovensdale Pearl's Renown
Veresdale Hetty	Vol. 8	273	N.C.K.	5,799	3·67	212·6	230	Jr. 2	.. ..	Ovensdale Pearl's Renown
Veresdale Posey	C.R.	273	N.C.K.	6,803	3·77	256·5	230	Jr. 2	.. ..	Numbawarra Maiden's Sultan
Veresdale Zepherous ..	Vol. 8	210	4	3,097	4·24	131·4	250	Sr. 2	.. ..	Ovensdale Pearl's Renown
Nicholas, A. M., Sherbrooke, Jersey (5).										
Brampton Champion's Miss (Imp.)	56042	273	12½	5,833	5·58	325·3	350	Mature	235, 273, 245, 274	Brampton Son of Champions (Imp.)
Selsey Jersey Lily ..	64221	273	24½	7,452	5·40	402·6	350	Mature	380, 423, 433	Selsey Brampton Boy
Selsey Princess Wyandotte	64223	273	10½	6,230	6·17	384·1	350	Mature	382, 390, 421	Selsey Brampton Boy
Selsey Rowan 4th ..	78881	273	18½	5,336	5·07	270·4	230	Jr. 2	.. ..	Brampton Son of Champions (Imp.)
Selsey Tally 2nd ..	69073	273	12	5,532	5·05	279·4	330	Sr. 4	297 ..	Brampton Sporting Standard (Imp.)
Noble, T. M., and Sons, Maffra, Jersey (2).										
Finchley Handsome Lady 5th	71316	273	N.C.K.	7,628	6·78	517·4	290	Sr. 3	438 ..	Finchley Masterman
Finchley Lillian 6th ..	76228	273	N.C.K.	8,463	6·20	524·6	270	Jr. 3	378 ..	Finchley Vasilika's Masterpiece
O'Neill, J., Echuca Village, Jersey (2).										
Ullina Marguerite ..	Vol. 29	273	16½	4,821	6·60	318·2	230	Jr. 2	.. ..	Mornmoot Satisfaction's Warrior
Ullina Satisfaction's Buttercup	Vol. 29	273	18	5,814	5·79	336·4	230	Jr. 2	.. ..	Mornmoot Satisfaction's Warrior
Parker, L. M., Tallarook, Dairy Shorthorn (3).										
Deep Dale Beauty 3rd ..	C.C.	273	12	7,992	3·63	290·0	250	Sr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Cherry 2nd ..	1803E	273	14	8,519	3·92	334·2	350	Mature	387, 463 ..	Willow Park Banker
Deep Dale Sally 2nd ..	C.C.	273	18	6,248	4·37	272·8	250	Sr. 2	.. ..	Willow Park Barrington 26th
Parkes, E. F., Merton, Jersey (2).										
Irona Benedictine ..	76931	240 (Sold)	..	4,492	5·35	240·2	290	Sr. 3	178, 217 ..	Irona Cute Boy
Irona Dreaming Cowslip ..	71881	240	4	4,380	5·15	225·5	310	Jr. 4	263, 224 ..	Dreamer's Hamptonne Star (Imp.)
Pattison, G., Tongala, Ayrshire (1).										
Willow Park Lauretto ..	C.R.	273	22½	6,543	4·04	264·4	230	Jr. 2	.. ..	Gowrie Park Jasper
Payne, A. E. T., Lilydale, Guernsey (2).										
Yarraview Julie	3560	273	24½	7,281	6·51	474·2	350	Mature	480, 353, 580, 551, 589, 707	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Siren	6643	273	30	9,525	5·45	519·5	350	Mature	407, 520, 528, 574	Camilla's Majestic of Maple Lodge (Imp.)
Phillips, J. H., Swan Hill, Jersey (1)										
Ryelands Wallflower ..	73840	273	23	7,751	5·40	418·8	310	Jr. 4	305, 377 ..	Banaview Master
Powell, T. S., Mansfield, Jersey (3).										
Carellen Golden Duchess ..	70638	273	24	8,442	4·50	379·7	270	Jr. 3	345 ..	Werribee Madeira's Ace
Carellen Melody 2nd ..	75608	273	24½	8,898	5·12	455·7	250	Sr. 2	333 ..	Mornmoot Majestrate
Montery Maid's Mermaid ..	58528	273	20½	10,968	4·26	466·6	350	Mature	442, 439, 376, 608, 501	Rosecliff Mariposa's Master
Read, Estate of the late J. D., Springhurst, Jersey (3).										
Springhurst Aniline Narcissus	55270	273	17	6,589	5·16	339·8	350	Mature	344, 435, 395, 428	Springhurst Design's Analyst
Springhurst Philidora's Tomato	73930	273	16	6,903	5·53	381·4	250	Sr. 2	344 ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Wexford Narcissus	78946	273	17	5,162	5·58	287·9	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Reid, Miss B. B., Bundoora, Jersey (1).										
Jubilee Liatris	67238	273	18	6,147	5·47	336·3	350	Mature	.. ..	Werribee Stylish Masterpiece
Richardson, W. S., Bacchus Marsh, Jersey (1).										
Willis Vale Captor's Laburnum	64017	273	19½	6,329	5·18	327·7	350	Mature	338 ..	Willis Vale Camellia's Captor
Ronalds, O., Tarago, Jersey (1).										
Jindivick Valencia ..	Vol. 29	273	32	7,118	4·85	344·9	230	Jr. 2	.. ..	Jindivick Airman

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Ross, D. M., Croydon, Dairy Shorthorn (1).										
Willow Park Damsel 12th	15220	273	N.C.K.	7,957	3·46	275·6	230	Jr. 2	.. ..	Willow Park Imperial Cran 10th
St. Joseph's Home, Sebastopol, Jersey (1).										
St. Joseph's Moya ..	78827	273	16	4,599	5·93	272·8	270	Jr. 3	.. ..	Lipook Golden Noble
Sadler, R. W., Noorat, Ayrshire (2).										
Burnbrae Lorraine ..	32016	273	N.C.K.	5,758	4·43	255·2	350	Mature	.. ..	Kerlie Park Emperor
Burnbrae Senorita ..	C.R	240	4	3,045	4·21	128·1	230	Jr. 2	.. ..	Kerlie Park Luminous
Smith, R. W., and Son, Swan Hill, Friesian (1).										
Wattle Bank Ashlyn ..	C.R.	273	25	8,649	3·03	262·3	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Stephens, Dr. F. G., Vermont, Guernsey (3).										
Cleveland Peace Bell ..	8494	273	18	6,264	5·10	319·7	310	Jr. 4	289, 111 ..	Melbourne Peter Pan
Roads End Antoinette ..	3409	273	6	6,542	4·78	313·0	350	Mature	398, 340, 303, 198, 295	Glenburnie Ideal (Imp.)
Vermont Nan	9564	273	15	5,333	5·20	277·3	250	Sr. 2	162 ..	Camilla Sunrise
Tait, W. G., Dreeite, Jersey (3).										
Glenvalley Silver Beauty ..	71548	273	20	5,924	6·35	376·0	330	Sr. 4	.. ..	Brucevale Wyandotte's King
Stonybank Gaiety Girl 11th	78963	273	18	6,021	4·98	299·7	230	Jr. 2	.. ..	Mornmoot Marius 2nd
Stonybank Prosperity ..	78970	273	16½	5,562	5·09	282·9	230	Jr. 2	.. ..	Mornmoot Marius 2nd
Thomas and Taylor, Hamilton, Ayrshire (5).										
Jennewar Beauty ..	30709	273	15	7,998	4·63	370·0	350	Mature	290, 329, 359, 377	Denbigh Ace
Jennewar Bettina ..	34707	273	21	7,145	4·34	310·0	230	Jr. 2	.. ..	Denbigh Ace
Jennewar Bunty ..	34708	273	12½	5,318	4·99	265·5	230	Jr. 2	.. ..	Denbigh Ace
Jennewar Lily Lady ..	34710	273	21	7,175	4·27	306·4	230	Jr. 2	.. ..	Denbigh Ace
Jennewar Sylvia 3rd ..	34711	273	24	6,804	4·23	287·9	230	Jr. 2	.. ..	Denbigh Ace
Turner, A. J., Yannathan, Jersey (2)										
Finchley Lady Peerless 6th	Vol. 29	150	4	1,875	6·81	127·6	230	Jr. 2	.. ..	Finchley Vasilika's Masterpiece
Selsey Royal Lotus ..	Vol. 29	273	17	6,546	5·21	341·3	230	Jr. 2	.. ..	Selsey Right Royal
Tyssen, C. J., Warragul, Jersey (7).										
Arranmore Pinafore 3rd ..	60320	273	17½	5,099	5·50	280·3	350	Mature	.. ..	Arranmore Gideon
Hylsbroke Daffodil ..	57731	273	17	6,711	5·47	367·0	350	Mature	444 ..	Latrobe Starjoy
Hylsbroke Goldfinch 5th ..	Vol. 29	273	22	5,871	4·51	264·6	230	Jr. 2	.. ..	The Wattles Young Gamboge
Hylsbroke Joy Step 5th ..	71837	273	17	6,297	5·35	337·2	330	Sr. 4	375 ..	Latrobe Starjoy
Hylsbroke Joy Step 8th ..	Vol. 29	273	18	5,276	5·31	280·1	230	Jr. 2	.. ..	The Wattles Young Gamboge
Hylsbroke Tiddlewinks 3rd	71842	273	18½	5,606	5·96	333·9	350	Mature	255 ..	Latrobe Dante
Willis Vale Captors Blossom	Vol. 29	273	18	6,567	5·40	354·8	350	Mature	364 ..	Willis Vale Camellia's Captor
Unthank, Miss Freda, Hastings, Jersey (2).										
St. Johns Jewel 10th ..	Vol. 29	273	N.C.K.	5,903	5·34	315·2	230	Jr. 2	.. ..	St. John's Letitia 10th's Chust
The Hollies Queen ..	50803	273	N.C.K.	7,853	5·23	410·5	350	Mature	.. ..	Jersey Hill Wonder
Vaughan Bros., Girgarre, Jersey (1).										
Lynroy Natty	62870	273	12	7,046	5·57	392·2	350	Mature	473, 544, 549	Werribee Laverock
Wade, W. J., Stratford, Jersey (8).										
Banyule Tiddlewinks 9th ..	34198	273	N.C.K.	6,981	4·82	336·2	350	Mature	314, 472, 448, 396, 418, 412	Concentration of Banyule
Glen Iris Golden Belle ..	52814	273	N.C.K.	7,415	5·14	380·9	350	Mature	294, 229, 378, 392	Design's Golden Oxford (Imp.)
Inverbroom Empress 2nd	48762	273	N.C.K.	6,282	4·31	270·5	350	Mature	350, 376, 356, 300, 288, 386	Economist of Aveley
Inverbroom Empress 7th ..	67090	273	N.C.K.	6,486	6·65	431·6	310	Jr. 4	301, 385 ..	Banyule Airport
Inverbroom Golden Marie..	76912	273	N.C.K.	5,573	5·66	315·4	250	Sr. 2	.. ..	Clarendon Eyre Eminent's Boomerang 4th
Inverbroom Majestic Empress	76913	273	N.C.K.	5,977	5·45	325·5	230	Jr. 2	.. ..	Inverbroom Majestic Airman
Inverbroom Silver Muriel 2nd	38483	273	N.C.K.	6,836	4·79	327·2	350	Mature	346, 379, 433, 419, 401, 387, 370, 276, 388	Economist of Aveley
Inverbroom Silvermine's Marie	44392	273	N.C.K.	7,700	5·22	401·9	350	Mature	429, 455, 495, 476, 589, 478	Economist of Aveley

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Walker, C. S., Swan Hill, Friesian (3).										
Warwick Colantha Empress	Vol. 15	273	35	11,774	2·96	348·5	270	Jr. 3	328 ..	Hengest Matador Walker
Warwick Mona Keys ..	C.R.	273	27	9,576	2·68	256·9	230	Jr. 2	.. ..	Greenvale Oakwood Patch
Warwick Violet Patch ..	C.R.	273	N.C.K.	11,151	2·88	321·7	270	Jr. 3	286 ..	Hengest Matador Walker
Walker, C. S., Swan Hill, Jersey (10).										
Clarendon Eyre Love Lies 9th	65950	273	N.C.K.	7,904	4·93	389·7	330	Sr. 4	226, 338, 362	Clarendon Eyre Golden Oxford
Grangelea Rose Petal 2nd..	53022	273	N.C.K.	5,687	6·10	346·7	350	Mature	321, 371, 288, 454, 398	Grangelea Cream Boy
Warwick Beauty 10th ..	79522	273	N.C.K.	7,587	5·42	411·4	270	Jr. 3	344 ..	Leven Brae A'do Masterpiece
Warwick Cream Stockings 2nd	69627	273	N.C.K.	9,080	5·58	506·8	350	Mature	334, 441 ..	Warwick Golden Lord
Warwick Fancy Madeira ..	Vol. 29	273	N.C.K.	7,092	4·96	352·0	250	Sr. 2	290 ..	Leven Brae A'do Masterpiece
Warwick Polly 10th ..	64826	273	48½	12,655	5·13	648·9	350	Mature	327, 348, 484	Glen Iris Golden Lord
Warwick Polly 18th ..	Vol. 29	273	13½	6,089	4·94	301·0	230	Jr. 2	.. ..	Leven Brae Ideal Masterpiece
Warwick Princess 12th ..	79536	273	N.C.K.	6,158	4·76	292·9	290	Sr. 3	300 ..	Warwick Golden Lord
Warwick Princess 13th ..	79531	273	N.C.K.	6,722	5·37	361·0	250	Sr. 2	306 ..	Leven Brae A'do Masterpiece
Warwick Rose Petal ..	Vol. 29	273	N.C.K.	6,722	5·03	338·0	270	Jr. 3	300 ..	Warwick Golden Lord
Waterhouse, H. W., and Son, Pakenham, Jersey (5).										
Navuloa Grandmaster's Harebell	63358	273	21½	7,838	5·25	411·6	330	Sr. 4	324, 429 ..	Werribee Grandmaster
Navuloa Laburnum's Harebell	78042	273	11½	5,630	5·61	315·6	230	Jr. 2	.. ..	Staghorn Laburnum's Masterpiece
Navuloa La Magnet ..	68275	273	20½	7,077	6·40	452·9	330	Sr. 4	355, 409 ..	Staghorn Laburnum's Masterpiece
Navuloa Magnetic ..	63361	273	22½	7,752	5·77	447·5	350	Mature	461, 428 ..	Werribee Grandmaster
Ovalau Wyandotte's Cream	78279	273	13	7,118	5·93	421·9	270	Jr. 3	299 ..	Brucevale Wyandotte's King
Whelpton, B., Whittesea, Jersey (5).										
Coodardy Gentle Annette 3rd	61157	273	26	7,248	4·30	311·4	350	Mature	336, 397 ..	Toorongo Belle's Bonaparte
Crystal Brook Bloom ..	47798	273	9	8,494	5·06	429·9	350	Mature	486 ..	Crystal Brook Noble
Jubilee Lagunaria ..	72009	273	8½	5,672	5·64	319·9	290	Sr. 3	.. ....	Werribee Stylish Masterpiece
Jubilee Lomatia	76987	273	13	5,799	5·16	299·0	270	Jr. 3	.. ..	Werribee Stylish Masterpiece
Wattle Grove Jeanette 2nd	55801	273	19	6,435	5·36	344·9	350	Mature	429 ..	Fairview Chief
Williams, Estate of the late F. A., Bamawm Extension, Jersey (2)										
Ballara Bonnie	33911	273	N.C.K.	5,896	6·25	368·6	350	Mature	402, 565, 629, 634, 691 615, 583, 650, 549	Brucevale Lord Fancy Madeira
Bamawm Mistress Peggy ..	56238	273	N.C.K.	8,016	5·02	402·2	350	Mature	373, 422, 344, 507, 519	Bamawm Bonnie Boy
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Lough View Beauty 2nd ..	32776	273	21½	6,851	3·85	263·8	330	Sr. 4	194 ..	Carracoorte Bobby
Lough View Hope ..	Vol. 35	273	19½	6,434	4·03	259·3	230	Jr. 2	.. ..	Grandview Bernie
Woodyer, P. A., Mornington, Jersey (5).										
Selma Millicent	78873	273	18	5,289	5·93	313·7	270	Jr. 3	.. ..	Glen Iris Golden Viol
Carramar Lady Mercedes 4th	C.R.	273	19	5,384	6·02	323·9	230	Jr. 2	.. ..	Waioma Viking
Carramar Noble Jessie 6th	C.R.	273	18	5,231	5·47	286·2	230	Jr. 2	.. ..	Waioma Viking
Rochdale La Mascotte 3rd	73708	273	18	6,027	4·92	296·3	290	Sr. 3	.. ..	Rochdale Lord
Selma Charm	C.R.	273	14	4,557	5·13	233·9	230	Jr. 2	.. ..	Glen Iris Golden Viol

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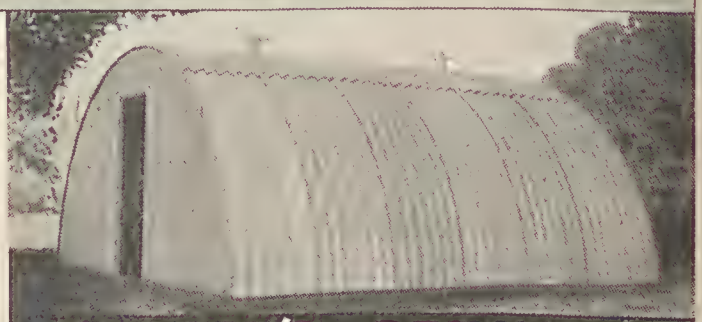

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Mallee Wheat Experiments

Variety Trials at Walpeup

By H. J. SIMS, M.Agr.Sc., Manager, Mallee Research Station, Walpeup,
C. G. WEBB, B.Agr.Sc., and G. BLACKBURN, B.Agr.Sc., Science Field Officers

Visitors inspecting the experimental plots at the Mallee Research Station.

OWING to wartime conditions, field days have not been held at the Mallee Research Station since 1940. Since that date, owing to enlistments in the forces, the staff of the station has been considerably reduced. As a result, the amount of experimental work has been curtailed, but much valuable work is still being undertaken.

Wheat yields obtained during the last two seasons have been above average. In 1941, a rather dry winter, but an exceptionally good spring, was experienced. In 1942, good winter rains fell, but, as so often happens in the Mallee, the September–October period was too dry to allow very high yields, although they were above average. The October rainfall appears satisfactory as a monthly total, but it fell on the last two days of the month.

At present, the main wheat experiments deal with the production and testing of new varieties for yield and disease resistance, and manurial, rotation and cultivation trials, including some sand drift control investigations.

The monthly rainfall at the Station for the past five years, together with the averages for 31 years, is given hereunder:—

Month.	1938.	1939.	1940.	1941.	1942.	Average 31 years.
January	125	13	38	358	36	71
February	49	343	58	12	89	87
March	..	12	19	99	5	76
April	81	222	145	16	80	77
May	2	135	23	9	182	122
June	36	183	14	185	206	132
July	167	87	92	161	218	119
August	51	150	36	61	232	133
September ..	6	47	135	148	64	136
October	8	37	17	253	116	139
November.. ..	9	196	76	95	116	90
December ..	2	3	48	73	30	93
Total ..	536	1,428	701	1,470	1,374	1,275
Averages April–October period ..	351	861	462	833	1,098	858

Cereal Breeding and Wheat Variety Trials

At the moment, labour and marketing difficulties have enforced a reduction of the area sown to wheat in the Mallee. But, whatever the area sown, the most suitable varieties should be used, for, in that way, the manpower required to produce a given quantity of produce will be reduced, and the net return to the farmer increased.

The production of new superior varieties of wheat, oats, and barley by hybridization and selection, and the subsequent development and testing of these forms, provide one of the most important and extensive aspects of the research work being conducted at the farm. Each year a large number of matings of desirable parents is made, and the progeny of these are grown and studied in nursery rows in the stud Cereal Plots. These rows are subjected to a drastic culling, and only those plants exhibiting desirable characters are retained for further selection and testing.

This selection work is continued for a number of years until only a few of the more promising true breeding strains of the original population are left. These are then grown in seed multiplication plots and finally pass to the larger field plots for accurate testing to determine their yielding capacity.

In addition to testing at the Research Station, promising new varieties and crossbreds are tested on farmers' properties at various centres throughout the Mallee. Last year, these plots were sown only in the Woomelang (Mr. A. E. Barbary) and Berriwillock (Mr. W. Cox) districts. In the previous year, in addition to these centres, plots were located at Werrimull (Mr. W. E. Kelly) and Ultima (Mr. W. Atkin), and before that, at Swan Hill (Mr. G. D. Brydon). In past years, other Mallee plots were conducted, but most of the varieties then tested have now been replaced by newer productions.

The results of the various trials are summarized in Table 1.

TABLE 1.—WHEAT VARIETY TRIALS IN THE MALLEE (REPLICATED).

Yields in Bushels per Acre.

Variety.	Walpeup.	Mallee Research Station.		Woomelang.		Berriwillock.	Ultima.	Werrimull.	Swan Hill.
	Average 15 years, 1928–42.	Average 3 years, 1940–42.	Average 6 years, 1937–42.	Average 2 years, 1941–42.	Average 3 years, 1940–42.	Average 3 years, 1940–42.	1941 only (drought).	Average 5 years, 1937–41.	Average 3 years, 1937–39.
Ranee 4H	25·0	21·7	26·4	21·6	16·5	21·3	10·4	11·5	27·7
Regalia	..	22·8	27·3	22·8	17·2	21·0	9·2	12·0	27·6
Bencubbin	..	22·8	27·5	23·2	18·0	..	9·7	11·7	27·7
Baldmin	..	21·9	27·4	23·0	17·5	..	8·6	10·9	27·6
Bobin	..	22·0	..	21·9	17·1	..	10·0	..	..
Pindar	..	21·7	26·5	14·3	11·9	22·9	8·6	10·5	28·1
Quadrat	..	22·4	27·7	16·2	13·3	24·5	8·8	..	..
Ghurka	23·7	20·8	23·7	13·4	11·2	22·5	9·0	10·1	26·9
Ghurka x Ranee M6173 ..	..	25·0	..	23·8	..	..	9·8	..	..
Ghurka x Ranee M5174 ..	..	24·2	..	..	..	..	..	..	..
Ranee Selection W5860 2 ..	..	22·0	..	22·2	..	..	10·8	..	..
Ghurka x Pusa 4 V9–2 ..	..	22·7	..	..	..	..	..	..	..

NOTE.—The yields per acre quoted above are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots.

Each year, the Victorian Wheat Advisory Committee, which includes representatives from the wheatgrowers, merchants, millers, bakers, and the Department of Agriculture, considers results of the varietal trials, and flour quality investigations and makes recommendations for district sowings. The latest recommendations for grain production are :—

—	Main Sowing.	Limited Sowing.
Mallee (Northern)	Regalia Ranee 4H Ghurka Bencubbin	Pindar Baldmin
Mallee (Southern)	Ghurka Ranee 4H Regalia	Pindar Bencubbin Dundee Baldmin Quadrat

Most of these varieties are either well known, or are becoming better known, throughout the various districts. **Ranee 4H and Ghurka are too well known to need any comment, and are still the standard varieties, but Regalia and Bencubbin are now widely grown, and increasing in popularity. In the Northern Mallee at least, they are expected in time to replace Ranee 4H and Ghurka.** Baldmin has demonstrated its yielding ability in many districts, but the straw weakness of this variety restricts its use to limited sowings only. Bencubbin also exhibits some straw weakness, especially in the more southerly areas.

A few comments on the two newer varieties may be of interest.

Pindar was produced by the Victorian Department of Agriculture, and first released from the Mallee Research Station in 1941. Formerly known as Ghurka Selection W595 O5, Pindar is a selection from Ghurka, and is a distinct improvement on the parent variety insofar as flour quality is concerned; furthermore, its grain is larger and more attractive. Its yield in the Mallee has been good, where it has consistently outyielded its parent. In other districts, this yield comparison has been variable. It is similar to Ghurka in disease resistance and field characteristics, except that it is slightly taller and a little earlier in maturity.

Quadrat also was produced by the Victorian Department of Agriculture, is a result of a cross between Ghurka and a crossbred Currawa x (Major x Gallipoli), and was first released for Wimmera conditions. However, it has yielded well in the southern and central portions of the Mallee. It is of the Ghurka type, being slightly taller, and has a bolder head than Ghurka, and has the desirable field characteristics and disease resistance of that parent. Its grain quality is comparable to that of Ghurka, but it has consistently outyielded that variety in tests in all portions of the State.

Typical heads of Regalia.

Cereal Diseases

Research work concerning several wheat diseases has been carried out at the Mallee Research Station, in the past, but now only varietal resistance to flag smut is being investigated. All important wheat varieties, and new crossbreds have been classified according to their resistance to this disease. The following table classifies the common varieties :—

Very Susceptible	Baldmin	Moderately Resistant	Currawa
	Federation		Gular
	Regalia	Resistant	Ghurka
	Free Gallipoli		Dundee
	Magnet		Quadrat
	Early Gluyas		Pindar
Susceptible	Ranee 4H		Nabawa
	Bobin		Bencubbin
	Rajah		
	Sepoy		

[Continued at foot of next page.

MAINTAIN MEAT PRODUCTION

Forage Crops in the Wheat Belt

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

TO aid in the prosecution of the war, and to fulfil our obligations to the United Kingdom, meat production in Victoria must be maintained at a high level. Wheat and wool are vital commodities, but fortunately there are sufficient supplies of these in sight for our needs of the near future. Wheat and wool growers therefore should plan to produce as much meat as possible, and make provision for the coming of those inevitable dry periods when natural pasturage will be scarce.

Labour is short, and there is much to be done on the farms, but the following action is suggested to those who are able to respond.

1. Sow immediately a maximum area of oats or other cereal grain to provide supplementary grazing for sheep in the winter, and until natural feed is abundant in the spring. This may be done cheaply and quickly in the wheat belt and is a regular practice with many farmers. If hay or grain can be harvested later from the same area, so much the better. The reserves of fodder in the State will be none too great, as in most southern districts the area planted with oats will show a marked decrease owing to shortage of labour and superphosphate and the call for priority crops such as flax. In fact, the wheat areas may yet be drawn upon to supply more hay, despite transport difficulties.

2. When planting cereals for grazing, hay or grain, do not spare the seed. At least 60 lb. per acre of oats should be used in the wheat belt, and heavier sowings are warranted if maximum grazing is to be obtained. The risk of the crop being too thick is negligible, particularly as no superphosphate will be available in most cases.

3. Use early-maturing varieties if seed is on hand, but any cereal grain sown early will provide more feed than most self-sown or natural pasturage.

4. If the autumn rains are late, take a risk and sow oats in dry soil. Early feed is the principal objective, and the wheat land will need attention after the rain.

5. Sow the wheat crops earlier than usual unless serious interference from weeds would result. Such early crops should provide feed in the winter, possibly just enough to make all the difference to the lambs. Although some loss in wheat yield may follow, particularly in the Mallee, the production and sale of a maximum number of fat lambs may be more remunerative than wheat in excess of the 3,000 bushel quota.

6. Some farmers have insufficient land to enable them to use their labour and machinery resources to a maximum. Others may be unable to use their greater areas to the best advantage under present conditions, and they are urged to make suitable land available when approached by farmers in the position to cultivate for fodder or hay crops.

7. Farmers with tractors or horse power in excess of their own immediate requirements could assist neighbours, and so continue the co-operative efforts which were displayed to such good effect during the recent harvest.

MALLEE WHEAT EXPERIMENTS—*continued from previous page.*

All new crossbreds sown in any yield trials in the State are being similarly classified. It is interesting to note the high resistance of the new varieties, Pindar and Quadrat. The use of resistant varieties is the most satisfactory method of control if flag smut has previously caused losses on a farm. It is wise to grow at least one resistant variety such as Pindar, Ghurka, Bencubbin or Ghurka for use on land where flag smut has been noticeable. A very promising new crossbred wheat is Ghurka x Ranee M6173. Included in the senior tests at the Research Station for the past three years, it has outyielded the best of the named varieties, Regalia and Bencubbin, by an average of 2·2 bushels per acre. It has also given the highest yield tests for two years at Woomelang.

Limited supplies of seed wheat of the main varieties are still available from the Research Station.

STINKWORT DANGERS

Mortality in Sheep Flocks

By H. M. ELDER, B.V.Sc., Veterinary Officer

DEATHS among sheep grazing on Stinkwort are commonly reported as being due to "Stinkwort poisoning"; actually they are due, not to a poison in the plant, but to the irritation of the lining of the stomach and intestines by the small hairs of the Stinkwort flower.

These small hairs, or "pappae," are readily seen when the flower has dried off and the petals have fallen, but they are present in the seed box even while the yellow petals are still on the flower. When examined under a microscope, each hair is seen to be like a "feathered" arrow with each component of the "feather" having a barbed point at the free end.

When the flower is eaten by sheep, these hairs become embedded in the lining of the stomach and intestines and cause irritation. Stinkwort, however, is not the only weed causing this condition. The New Holland Daisy commonly, though incorrectly, known as cotton-weed in the north-western Mallee, also causes mortality in sheep, and the flower of this, when examined under a microscope, shows hairs similar to those of the Stinkwort flower.

Cotton fire-weed also has somewhat similar hairs on the flower, although not so heavily barbed, but they may cause mortality.

Two distinct types of disease may be caused in sheep by these weeds. The irritation of the lining membrane of the intestine may produce sufficient enteritis to cause death; or the minute punctures of the mucous membrane may allow absorption of the toxins produced by the organism of entero-toxaemia, and the sheep dies from entero-toxaemia (commonly known as "pulpy kidney").

The usual history is that a number of sheep have died suddenly without showing any previous symptoms, and others have been sick for a period of from a day to a few days before death occurs.

When enteritis is produced, the animal appears rather mopey and "tucked-up," and is affected with diarrhoea. Death ensues within a few days. On post-mortem examination, areas of inflammation will be found in the lining of the intestines and portions of the weed will be found in the food contents of the stomach.

Stinkwort (*Inula Graveolens*).

A.—The plant. B.—Flower-heads in axils of leaves. C.—Floret with seed and pappus. D.—Tubular-floret with seed and pappus. E.—Seed with pappus fully matured. F.—A leaf showing hispid glandular hairs.

When entero-toxaemia is produced, the symptoms are exactly the same as when the disease occurs in sheep or lambs on green pasture. The animals are frequently found dead without showing any previous symptoms, or they may be found in a comatose condition shortly before death. Bloating before death is common.

Others may be suddenly attacked with a convulsion or " fit," and death ensues within a few hours or less. They usually grind the teeth and froth at the mouth while affected. This convulsive type is more common in lambs than in sheep.

On post-mortem examination the usual signs of entero-toxaemia are present. In both forms of mortality, deaths usually continue for several days after sheep are removed from paddocks containing Stinkwort or the other weeds mentioned, as the hairs are still present in the intestines. It should be noted that deaths from both conditions frequently occur in a flock at the same time. The mortality commences very suddenly, and a large number of sheep may die in a few days.

Treatment is not successful, although a mild laxative such as paraffin oil may be of value. *A strong purgative should not be given, as it would further irritate the intestines.*

Vaccination is of no value as, even if immunity against entero-toxaemia were produced, deaths would continue from enteritis if the sheep were left on the Stinkwort.

Immunity against entero-toxaemia would not be produced by the vaccine until about ten days after inoculation, whereas deaths from both enteritis and entero-toxaemia would cease in less time than this if the sheep were removed to clean paddocks.

The obvious way to prevent the mortality is to remove sheep from Stinkwort before it begins to flower, as it is dangerous throughout the flowering stage; i.e., from the time the flowers first appear till the dry fluffy hairs have disappeared from the dried flower.

Stinkwort is not recommended as a good fodder at any time, but it may be grazed safely while green before the flowers appear, and if a property is heavily infested with it, and it cannot be eradicated, it should be grazed short while it is green, so that it is well eaten down before flowering time. Sheep should then be moved on to other feed until the flowers have died, and the dried hairs have disappeared from the plant. The plant then has no food value, as it consists mainly of dry innutritious stalks.

Some sheep owners consider that Stinkwort is dangerous only just after rain has fallen while the plant is in flower, but this is not so, as mortality frequently occurs when there has been no recent rain.

Other owners state that they have frequently grazed sheep on flowering Stinkwort without ill effect; but it is usually found that, in these cases, there is considerable growth of other feed in the paddock, and, consequently, only a small proportion of the sheep's diet consists of Stinkwort.

Mortality is certainly heavier in a dry season when there is no other green feed available, and probably only a small proportion of dry feed in the paddock. The sheep are then attracted by the green Stinkwort and eat large quantities of it.

However, deaths may occur even when there is other feed in the paddock, and the margin of safety is too small to warrant the risk involved.

The safest procedure is to prevent sheep and lambs from grazing on Stinkwort or New Holland Daisy while flowers are present.

Prosecutions Under The Cattle Compensation Act

At Bunyip and Pakenham Courts of Petty Sessions, on 24th and 25th February, respectively, the undermentioned persons were convicted and fined for failing to give the stamped statements required under Section 12 of the Cattle Compensation Act.

Section 12 requires the owner of cattle on the sale thereof to write out a statement containing the date of sale, the number and value of cattle sold and to affix to this statement and, cancel Cattle Duty Stamps to the value of 1d. in the £1 or fraction thereof of the purchase money. This statement must be given or forwarded by registered post to the purchaser within seven days of the date of sale. An offender against any one of these requirements is liable to a penalty of up to £50.

C. O. Leamon was fined £4 with 6s. 7d. costs. A. W. Duncan was fined £2 with 6s. 6d. costs. S. Accardi was fined £2 and £1 with 6s. 7d. costs. W. J. Kenny was fined £2 and three at £1 with 6s. 6d. costs. H. Hare was fined £2 with 6s. 7d. costs. E. J. Whitta was fined £2 with 6s. 7d. costs.

Fertilizer Rationing Notes

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

NOW that most farmers and graziers have ordered their ration of superphosphate for use this season, the full severity of rationing is being felt. Many farmers are realizing for the first time that a ration of only one-third of their normal purchases means that some of their crops will have to be sown without superphosphate or, alternatively, that the crop area must be reduced. Those who normally use 60 lb. per acre have only sufficient for 20 lb. per acre, and there are few if any drills which distribute such a low dressing. To have to plant crops without superphosphate is particularly serious to the grower of wheat, oats, and barley. Drills should be overhauled to give the maximum efficiency in spreading the light dressing, and the pinions and manure stars found or obtained immediately.

What the scarcity of supplies means to Victoria may be seen from the figures showing the total sales of superphosphate in Victoria in recent years.

SUPERPHOSPHATE SALES BY VICTORIAN MANUFACTURERS.

	Tons.
1937–38	484,640
1938–39	403,299
1939–40	367,530
1940–41	366,875
1941–42	256,065
1942–43	178,320

The total quantity of superphosphate available this season (1942-43) is only 48·6 per cent. of that sold in 1939-40 and 36·8 per cent. of that used in the peak year of use in 1937-38. When it is remembered that the phosphoric acid content of the superphosphate this year is only 18 per cent. as compared with 22 per cent. in previous years, it will be realized that the fertilizing value of the State's ration this year is barely 30 per cent. of its value in 1938. There is little prospect of greater total supplies next season, and farmers, therefore, must adjust their practices and stocking to the new circumstances brought about by the war.

Priority crops, such as vegetables, potatoes, flax, and blue peas, must be provided for, so reducing supplies for other purposes. With a big demand for dairy produce and meat, it is particularly serious that Victorian pastures cannot be top-dressed and maintained in a state of high productivity, but every effort is being made to increase imports of phosphatic rock from which superphosphate is made.

Sales of Fertilizers by Auction

The National Security Regulations provide that sales of artificial fertilizers may be made only with the approval of the Director of Agriculture. Approval for private transactions and sales by auction may be given if the circumstances warrant them, and subject to the names of the purchasers being supplied to the Department. The Prices Commissioner has ruled that the price paid must not exceed the cost to the vendor. In cases where the sale is made because of a change in ownership of a property, the incoming farmer has the first right of purchase, as "the ration goes with the land." Disputed cases should be referred to the Department of Agriculture for decision.

Special Rations for Flax

Special rations for flax are available, and the necessary application form may be obtained from the manager of the flax mill to which the grower supplies his flax.

Supplementary Rations for Dairy Farms and Irrigated Pastures

An announcement will be made soon regarding the small additional ration to be made available to bona fide dairy farmers and for sown-down irrigated pastures.

Farmers who, since 1st July last, obtained a special ration for priority crops such as vegetables and potatoes, and who normally use superphosphate also on non-priority crops or for top-dressing pastures, may now have their ration assessed for non-priority use. A special form has been posted to such farmers, and any who have failed to receive one should apply for another.

It was announced in December last that the 55 per cent. standard ration which is still being distributed should provide most farmers with one-third of the amount of superphosphate

they have used annually in recent years. Consumers who would not receive this amount by the operation of the plan are entitled to apply to the Department for an adjustment of their case, but all such appeals should have been lodged already. Further claims may be made, but the volume of correspondence on hand precludes the possibility of an immediate reply.

Farmers who usually purchase on behalf of others are reminded that they must make the appropriate rations available to those whom they normally supply.

The superphosphate rationing plan provided the maximum ration available, and it is emphasized that extra rations cannot be granted on the grounds that production would be lowered. To do so would reduce the rations of others.

Fertilizers for Vegetables

Superphosphate and mixed fertilizers containing sulphate of ammonia are obtainable after application on the prescribed form, and animal fertilizers such as "blood and bone" are available to recognized vegetable growers from their usual supplier.

All users of fertilizers, and especially growers of priority crops, are urged to obtain their rations some time before they are required, and so ensure that they will be on hand should delays in assessments or transport occur.

All correspondence should be addressed to the Officer in Charge, Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne, C.1.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Pietsch, R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark," Nhill	Spiers, Albert	Bamawm Extension
Ellwood, A. H. ..	Paschendaele	State Experiment Farm ..	Rutherglen
Fairchild and Clutterbuck	Tinamba	Sutherland, R. N. ..	Nullawill
Geddes, L. D.	Bungaree	Trenery and Soderlund ..	"Promview," Foster
Hamblin, A. T., & Sons..	Toolleen	Trigg, A. J.	Bungaree
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
Hawtin, I. E. and F., ..	"Rossmoyne," Colac	Tweddle, J. T.	"Winlaton," Shepparton
Haywood, Dr. A. R. ..	Hastings	Walch, M. U.	Baring

Artificial Fertilizers for 1943

Registrations and Unit Values

By W. C. ROBERTSON, Chemist

Superphosphate in store being handled with a mechanical shovel.

THE main list of brands of fertilizers registered under the Fertilizers Act and the unit values for the 1943 season which appear in this issue present unusual features which are due entirely to war conditions. There is a decrease of approximately 23 per cent. in the number of brands registered for 1943 compared with the registrations of the previous season, and a decrease of over 50 per cent. compared with pre-war years. The decrease in brands registered is not accompanied by any marked decrease in the number of factories or manufacturers. In the case of the three principal manufacturers the shortage of raw material, together with manpower requirements, has resulted in a heavy curtailment in output and in the removal of many well-known mixtures from the list.

Perhaps the most outstanding, if not the most important feature, is the cessation in the manufacture of 22 per cent. superphosphate, which is being replaced by the manufacture of ordinary "super." of 18 per cent. quality. This grade closely resembles the quality of the superphosphate so extensively used when the remarkable deficiency of our soils in phosphoric acid was first exposed toward the end of last century, and the efficacy of a dressing of "super." was persistently shown in the results obtained from experimental plots established throughout the State. The familiar 22 per cent. superphosphate of recent years (which, although registered by one manufacturer, is not being manufactured and, therefore, will not be available after existing rationed stocks are used up) was renowned as the highest quality ordinary superphosphate in the world, because of its high content of available phosphoric acid, i.e., 21 per cent. The new superphosphate which is termed "18 per cent." contains only 16½ per cent. of available phosphoric acid. As the value of "super." or superior phosphate in any country depends upon the availability of the phosphate, it will

be appreciated that there is a decline in the quality of our most important fertilizer. Although this decline in quality alone would not result in any very serious loss in production the yields obtained from the used of 17 per cent. "super." in the early years of the present century, and the fact that it is similar to the quality used abroad, justify the belief that the lower grade fertilizer now being marketed will produce satisfactory results. For all practical purposes, especially under present circumstances, the use of some "super.," even if of slightly lower quality than usuual, means the difference between success and failure of the crop. Another important new feature associated with fertilizers and the Fertilizers Act is the prices per ton and unit values associated therewith. Water soluble phospohoris acid at 6s. 6d. per cent. per ton has never been higher since the inception of the Fertilizers Act. Sulphate of ammonia at £18 10s. per ton (Victoria) compares with £9 14s. 6d. up to June, 1942, in Great Britain. While the local price for sodium nitrate is £18 10s., the fertilizer can be purchased abroad at £10 14s. per ton. The unit values for ammoniacal and nitrate nitrogen in the form of commercial fertilizers in Victoria are therefore very much higher than in Great Britain. On the other hand, the unit value for nitrogen in Dried Blood in Victoria at 20s. per cent. per ton compares more than favorably with the figure (31s.) paid in the Old World.

"Tankage," as it is called in England and U.S.A. or "blood and bone" and "animal fertilizer" in Australia, with a composition of 7 per cent. of nitrogen and 12 per cent. of phosphoric acid, is quoted at £13 per ton abroad, while local users pay £10, f.o.r. So that it will be observed that, whereas prices for mineral fertilizers in England are much lower than the prices charged the local farmer for similar fertilizers, the values are completely reversed when animal fertilizers are involved. In both countries the prices are subject to government control, and the striking differences are due solely to the conditions of the times.

A nitrogenous fertilizer (organic) very popular in other parts of the world, but unknown in Victoria, is Hoof and Horn Meal. Solely nitrogenous and slow-acting, its main asset is its long-term action. The article marketed in England is a fine, white powder, containing 13 per cent. of nitrogen, used extensively in intense culture and quoted at £17 10s. per ton. A similar article in Victoria would command a fixed price of £13 per ton, with every chance of becoming popular with northern irrigationists as a summer nitrogenous fertilizer.

The following fixed prices for the main simple fertilizers registered in Victoria should be noted:—

	Per ton. £	s.	d.
Sodium Nitrate ..	18	10	0
Sulphate of Ammonia ..	18	10	0
Superphosphate 18 per cent.	5	6	0
Superphosphate 22 per cent.	6	6	0
Potash Sulphate ..	22	10	0
Potash Chloride ..	20	0	0

Limited supplies of 22 per cent. "super." are available at a price calculated on the fixed price of £5 6s. for the fertilizer now being manufactured. Potash salts as such are only available under special conditions, if at all.

National Security (Prices) Regulations, Prices Regulation Order No. 95, fixes the maximum retail price per ton for all animal fertilizers (defined as blood manures, dried blood, blood and bone, bone and all fertilizers of animal origin) at a maximum unit value for nitrogen and phosphoric acid of 20s. and 5s. respectively. This means that a blood and bone fertilizer guaranteed to contain 7 per cent. of nitrogen and 10 per cent. of phosphoric acid could command a maximum price of:—

	£	s.	d.
7 per cent. nitrogen @ 20s. for each 1 per cent. ..	7	0	0
10 per cent. phosphoric acid @ 5s. for each 1 per cent.	2	10	0
	9	10	0

The price being f.o.r. or f.o.b. Melbourne or in inland districts f.o.r. at nearest railway station.

The list of registered fertilizers will be found at the back of this *Journal*.

BE A GOOD NEIGHBOUR TO YOUR NEIGHBOUR

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Wheat and Barley

WHEN it is considered that wheat and barley are the cheapest stock footstuffs available, the limited extent to which they are fed is surprising.

For many years prior to the outbreak of war, large quantities of bran and pollard were available, and stock owners based their rations on these foodstuffs, but now that they are in short supply difficulty is sometimes experienced in computing rations. Compared with some other concentrates, bran and pollard are both fairly bulky foods, containing considerable quantities of fibre, and this makes them fairly safe to feed, particularly to dairy cows. In addition to its use as a food, bran is fed largely as a leavener and appetiser. In practice, 1 lb. of wheat or barley may be fed to replace 1 lb. of pollard.

The Cheapest Way to Buy Wheat.

All wheat produced over and above the amount required by the grower for use on his own farm has to be sold to the Australian Wheat Board, 515 Collins-street, Melbourne.

The cheapest way to buy wheat is to buy it direct from the Board at the Board's price —3s. 6¾d. per bushel, Williamstown basis. The buyer is allowed freight from the railway station from which it is consigned to Williamstown, and is charged freight from the consigning station to its destination. Where wheat has to be railed, the Board will sell in truck lots only. The respective capacity of an 11-ton and a 16-ton truck is 132 and 192 bags. If the buyer takes delivery direct from a grower or in a country district where stacks are open, the Board will sell in any quantity from one bag upwards. Where wheat has to be railed, the smaller feeder is at a disadvantage, unless he can arrange with neighbouring farmers to share a truck lot with him.

In all transactions, the Australian Wheat Board requires cash with the order, necessitating a *pro forma* payment of 10s. 9d. per bag. After the wheat has been weighed by the Railways, or other acceptable authority, any difference between the *pro forma* payment and the actual value of the wheat is adjusted between the buyer and the Board. The *pro forma* payment for an 11-ton truck will amount to £79 19s., and for a 16-ton truck, £103 4s.

Stock feeders may purchase wheat from the Board, and take delivery direct from the

grower by applying in writing to the Board, stating the quantity they desire to buy, the full name and address of the grower, and the grower's nearest railway station. At the same time they should enclose a cheque as *pro forma* payment at the rate of 10s. 9d. per bag.

On receipt of this application and cheque, the Board will forward to the buyer, in duplicate, the special form required for this transaction, and known as the "P.B." form. Part 1 of this form has to be filled in by the grower, and Part 2 by the buyer. Responsibility rests with the buyer to ensure that the forms are filled in and that both the original and duplicate are returned promptly to the Board. There is no limit to the quantity of wheat that can be purchased in this way, and any method of arriving at the weight (in bushels) acceptable to the grower will be accepted by the Board. The weight must be shown on the "P.B." form, and a final adjustment with the buyer is made on this weight. The grower is also issued with a certificate, against which he will receive his advances in the usual way.

If the buyer is a licensed wheat grower, he has to forward a statutory declaration to the Board that the wheat is required, and will be used solely for stock and poultry feeding.

The Board will also re-sell a grower's own wheat back to him at a price equal to the advances paid, plus a small handling charge.

The Cheapest Way to Buy Barley.

The Australian Barley Board, 483 Collins-street, Melbourne, controls barley, and the cheapest way to buy feed barley is direct from the Board at the following prices per bushel:—

Feed English 2s. 4d., f.o.r. Wimmera and Mallee sidings for truck lots only; Feed English 2s. 6d., No. 3 English 2s. 7d., f.o.r. Melbourne sidings for 50-bag or full truck lots.

Owing to the demands on the railways, trucks cannot always be provided for less than full truck lots, and therefore sales of 50-bag lots are confined to deliveries from Melbourne stores.

The Board will also sell quantities down to bag lots at an increase of 2d. per bushel on the foregoing prices, but deliveries will be made at the Melbourne stores only.

Stocks of Cape barleys are exhausted, and only Feed and No. 3 English are available. All barley being offered is old crop, and until this has been sold, no new crop barley is being offered. Further, the prices mentioned above refer to the old crop only.

The Australian Barley Board also requires cash with the order, necessitating a *pro forma* payment of 8s. per bag for Feed English barley ex Wimmera and Mallee sidings, or 8s. 6d. per bag for Feed English, or 8s. 9d. for English No. 3 ex Melbourne Stores. For this purpose an advance payment of £21 5s. for 50 bags, £61 12s. 6d. for an 11-ton truck (145 bags), or £91 7s. 6d. for a 16-ton truck (215 bags), has to be made for Feed English barley from Melbourne Stores. For Feed English barley in 11 and 16 ton truck lots, f.o.r. Wimmera and Mallee sidings, the advance payments are £58 and £86 respectively. Most farmers should be in a position to buy 50-bag lots, but wherever possible farmers should arrange to buy a 16-ton truck lot and divide it amongst themselves.

Wheat *versus* Barley.

As a stock food barley is better known than wheat, although in actual fact there is very little difference between the two grains. In practice, the difference is in favour of wheat, because the wheat offered is f.a.q. (fair average quality), whereas the barley is low quality Feed and No. 3 grades.

At present, where freight costs are the same, barley is cheaper than wheat, since, with wheat at 3s. 6¾d. per bushel, a comparative price for barley would be 2s. 10¾d. The Australian Barley Board's price for barley is 2s. 6d. to 2s. 7d. These prices also should be compared with retail prices, which vary up to 5s. per bushel for wheat, 4s. 3d. for barley, and even more for ground wheat or barley. No farmer can afford to pay such prices, and every farmer with more than 500 fowls, or who is fattening 100 pigs per year and depending upon purchased grain, must consider buying grain direct from the respective Boards and grinding it himself.

A common retail price for wheat is 4s. 2d. per bushel, and for ground wheat (wheat meal) 1s. 6d. per bushel of 20 lb. At these prices, a poultry farmer with 1,000 fowls would spend over £46 per year more for feed than if he purchased his feed direct from the Australian Wheat Board at 3s. 6¾d. per bushel.

A poultry farmer, with 1,000 fowls, may use up to 1,250 bushels of wheat per year. About 750 bushels would be fed as whole grain and 500 bushels would be ground to replace pollard. At 3s. 6¾d. per bushel, this quantity of grain would cost £222 13s. 2d. At 4s. 2d. for the whole grain and 1s. 6d. per 20 lb. for the ground grain, the cost would be £268 15s. The

difference—£46—would represent the convenience of having 500 bushels ground and of buying through a retailer. It should not cost more than 3d. per bushel to grind wheat on the farm. The farmer grinding his own grain is also sure of the quality of the grain used.

Dairy Cows

When the time has arrived to dry off a cow, it is best to cease milking her altogether and turn her out into a paddock, where she can be watched for signs of inflammation of the udder. This method of drying off provides more time for other jobs, such as attention to water supply; cleansing of drains—particularly those leading from the cow-yards, lanes, and gateways; filling in depressions in lanes, at gateways and water troughs; repairing fences; and top-dressing.

Autumn provides a good opportunity to clean out silted-up dams before they are refilled by the late autumn rains. At the present time this work may appear to be beyond the capacity of most farmers with the limited amount of labour available, but the work should be done where possible, as it may save considerable labour later in the year, when labour will be in even greater demand than at present. The task would be small compared with the daily carting of water or the loss of grazing in certain paddocks if the dams failed.

Mud causes much drudgery on dairy farms, and a few hours spent in cleansing drains and filling in holes in hollows about gateways, lanes, and water troughs is time well spent. Apart from the discomfort and inconvenience of muddy conditions, much labour is saved if cows have not to be forcibly driven through mud, and when there are no muddy teats or udders to wash.

Top-dressing should be completed in time for the superphosphate to stimulate autumn and winter growth.

Sheep

Many of the troubles and losses among sheep owners at this time of the year are due to a reduction in both the quantity and quality of the paddock feed. This also occurs at a time when the food requirements of the sheep are increasing on account of cooler weather and, in ewes, advancing pregnancy or lambing. Where an early break occurs, the position corrects itself, as fresh green grass grows up amongst the dry herbage and provides an abundance of well-balanced fodder. Where the break is late the dry fodder loses much of the nutriment, becomes unpalatable, and provides only a portion of the sheep's requirements. Unless given some supplementary feed the sheep draw on the reserves in their bodies, and become very susceptible to pregnancy toxaemia, toxaemic jaundice, and infestations of internal parasites. A similar state of affairs frequently occurs after a late break with short green herbage and no roughage left to balance it. The sheep then have only a watery grass, rich in partially synthesized food materials which cause scouring, and which fail to provide sufficient nutrients.

To guard against losses under these conditions, it is advisable to commence supplementary feeding, particularly to lambing ewes and weaners, very shortly after the paddock feed fails to provide sufficient grazing.

The best supplementary feed is a mixture of lucerne hay and whole grain. Three-quarters of a lb. per day of each is sufficient to fully maintain a pregnant ewe, but as the pastures, no matter how bare they look, will provide some feed, it is seldom necessary to feed anything like that amount, and normally 2 to 4 oz. per sheep per day is sufficient.

Grain is the cheapest feed and, therefore, unless lucerne hay is available, fullest use should be made of wheat, barley, or oats. Where grain has to be bought, wheat and barley will be the cheapest, and the best ways of purchasing them have been mentioned earlier in these notes.

Grain is deficient in lime and, therefore, when grain is being fed, some provision must be made to make lime available. With trough feed, 1 lb. of lime can be mixed in the troughs with every 100 lb. of grain, but when the grain is fed out on the ground, the lime will have to be fed as a lick by mixing equal parts of salt and lime, and allowing the sheep free access to the mixture. To procure the necessary salt, a permit must be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

It has been shown previously in these notes (April, 1942), that sheep fed for 27 months on rations of chaff and grain containing 1 per cent. lime thrived well, whereas similar sheep fed the same rations, without the lime, gained for a short period, but gradually lost condition, and suffered teeth malformations and other drawbacks until they eventually died.

The importance of feeding lime to grain-fed sheep, and the need for supplementary feeding where pasturage is deficient cannot be overemphasized.

Pigs

When sows have weaned their litters they should be fed so as to improve their condition rapidly, and this rate of improvement should be continued during the early part of their pregnancy, and steadied down during the latter part so that the sows are in good condition, but not so fat as to make them inactive or clumsy by the end of the pregnancy.

To control the condition of sows as described above, it is necessary to hand-feed dry sows instead of self-feeding them, and it is also necessary to have the dry sows graded into at least two lots according to their condition.

The diet of pregnant sows should contain some separated milk or meat meal, and some grain, and it is most desirable that they should have access to pasture, green food, or lucerne hay or chaff. When the milk supply is limited the sows should have access to a trough containing a mixture of 4 parts ground limestone and 1 part salt.

Young pigs are unable to withstand the dangers of their early life unless their mothers have been fed a diet sufficient in both quantity and quality throughout the gestation period.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry

The maximum number of eggs is obtained when fowls are kept in laying houses, but best results are obtained only when the birds are kept under healthful conditions and are properly fed.

The ideal laying house is properly ventilated, free from draughts, has a concrete floor well covered with clean straw and providing ample space for each bird. The perches and other fittings should be properly constructed so that they can be kept free from vermin.

Under these conditions the birds can be kept under complete control and in good health. With an outside run disease cannot be so well controlled, nor the birds so well managed as in a laying house with a concrete floor.

Owing to the shortage of labour, the laying pens on many farms have not always been kept as clean as they should be, and in consequence the birds had suffered somewhat in health.

Litter becomes contaminated with worm eggs and disease-producing organisms, and should be removed at regular intervals, otherwise the birds will become lowered in vigour to such an extent that they will fall easy victims to disease. If the litter is changed every three months, and the perches are kept completely free from red mite, and the birds fed on a variety of food with ample greenstuff, they will do well. It is essential that routine work of this nature be carried out regularly to maintain healthy birds.

Birds required for breeding should already have been selected, and the remainder of the culled birds should be disposed of as soon as possible. Only the best birds, free from every form of weakness and under-development, are suitable for breeding purposes.

[H. F. Clinton, Poultry Expert.]

Bees

With the end of the honey season in sight, the first consideration of the apiarist should be to leave sufficient honey with the colony to ensure its existence through the cold winter months, when little or no nectar is available from natural sources.

In pre-war days, risks were often taken, and all available honey extracted from the combs, with the knowledge that, if the bees failed to gather sufficient nectar for their requirements during the late autumn, supplies could be supplemented by feeding sugar syrup.

Present restrictions on the purchase of sugar should be kept in mind, as it may not be possible to secure supplies for feeding bees, when serious losses from starvation may occur. It has been noted that the present high price and light yield of honey has been responsible for closer extraction than usual in some cases. This is to be regretted, as, in the event of sugar not being available for feeding purposes, it must react adversely against the bee-keepers concerned.

During the past month "Messmate" (*Eucalyptus obliqua*) has proved a boon to a number of migratory bee-keepers and others situated adjacent to forests where this eucalypt was in bloom. The yield of nectar and pollen from this source provided an ample supply to carry the bees through winter, and, in most cases, a liberal surplus for the owner.

[J. W. Thomlinson, Apiary Inspector.]

VETERINARY NOTES

Black Spot in Cows

Black Spot in cows is an infection of the secretion at the orifice of heifer's teats, and as a rule it takes place before calving. When milk secretion commences the infection flares

 [*Continued on page 217*

Victorian F.A.Q. Wheat

Analysis of 1943 Sample

By W. R. JEWELL, M.Sc., Agricultural Research Chemist

A portion of the official F.A.Q. wheat sample, made available by the Victorian Chamber of Commerce, has been critically examined as in former years. The results of analysis, and of milling and baking tests, are given below; results for the preceding seven years are given for comparison.

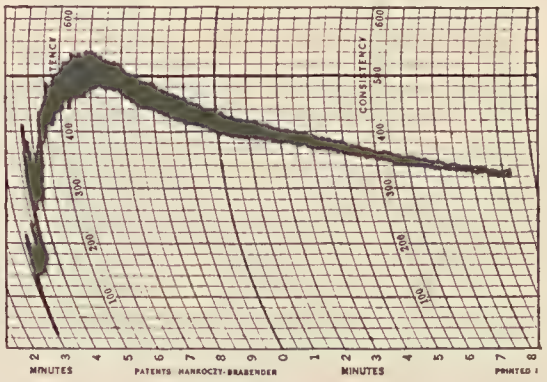
Wheat

The bushel weight, which was struck at 64¼ lb., is well above average and has been exceeded only once in recent years. The sample, somewhat dull in appearance, has a low dockage which consists mainly of small, pinched and broken grain, husks and a few wild oats; the dockage includes grain less than 2 m.m. The protein content 11·18 per cent., is relatively high and quality, as measured by the Pelshenke figure, is up to average.

Flour

The cleaned wheat, conditioned to 15 per cent. moisture, milled easily to give a normal yield of clean, bright flour with the usual low ash content. The gluten content is good and the quality, as measured by the Farinograph is satisfactory. The Brabender Farinograph diagram is shown in the illustration and is generally well balanced, indicating a satisfactory baker's flour. The maltose figure is rather lower than usual, a fault that can readily be rectified by the addition of malt flour or malt extract.

The results of the standard baking tests are given in Table III., on the next page.



Farinogram for 1943 sample of F.A.Q. wheat.

Baking Tests

The baking tests show a decided improvement on those of last year. The "basic" loaf was rather green; the malt phosphate addition has improved both volume, crust and general appearance, confirming that baking properties can be improved by the addition of yeast foods. This year an appreciable benefit was obtained by the further addition of bromate, suggesting that this season's flour will improve with age and respond to the usual improvers. These tests indicate that the flour from this season's wheat should be better than average and should prove quite satisfactory under usual bakehouse technique.

Normal yields of bran and pollard were obtained, with protein contents of 14·8 and 16·4 per cent. respectively.

TABLE I.—ANALYTICAL RESULTS.—WHEAT.

	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Moisture (per cent.)	12·2	12·7	11·8	9·1	10·7	11·0	10·5	11·2
Impurities (screenings) (per cent.)	4·9	4·5	5·3	3·4	4·1	3·8	5·3	3·7
Ash (per cent.)	1·41	1·34	1·30	1·26	1·43	1·20	1·23	1·25
Protein (N x 5·7) (per cent.)	9·74	9·80	11·09	12·81	9·78	11·74	10·28	11·18
Bushel Weight (lbs)	63½	62	63½	64½	63½	64¼	63¾	64¼
Pelshenke figure (minutes)	26	24	28	36	26	39	32	33

TABLE II.—ANALYTICAL RESULTS.—FLOUR.

—	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Moisture (per cent.)	..	..	11·6	11·1	12·6	12·4	13·2	13·6
Yield (per cent.)	73·6	71·3	73·8	71·3	72·9	73·2	70·0	71·7
Ash (per cent.)	0·48	0·50	0·48	0·54	0·48	0·47	0·48	0·46
Protein (N x 5·7) (per cent.)	9·09	9·12	9·92	11·17	8·78	10·43	9·04	10·0
Wet Gluten (per cent.)	27·4	26.4	30·4	38·7	28·8	30·8	25·7	30·0
Dry Gluten (per cent.)	9·1	8.4	9·9	12·2	9·5	10·4	8·6	10·1
Water absorption—								
Hand (per cent.)	50·0	50·2	50·6	50·0	50·2	52·5	51·5	52·0
Farinograph (per cent.)	..	..	54·5	63·0	57·4	61·8	57·5	57·5
Maltose figure	159	142	152	168	155	152	142	110
Valorimeter No. (farinograph)	..	..	34	46	42	44	38	39

TABLE III.—BAKING TESTS (100 GRM. FLOUR.)

Procedure.	Loaf Volume in c.c.					
	1938.	1939.	1940.	1941.	1942.	1943.
Basic	450	397	392	442	440	440
Basic + malt + phosphate	510	475	460	517	475	490
Basic + malt + phosphate + bromate	490	517	497	561	460	505

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942 issue of the *Journal of Agriculture.*

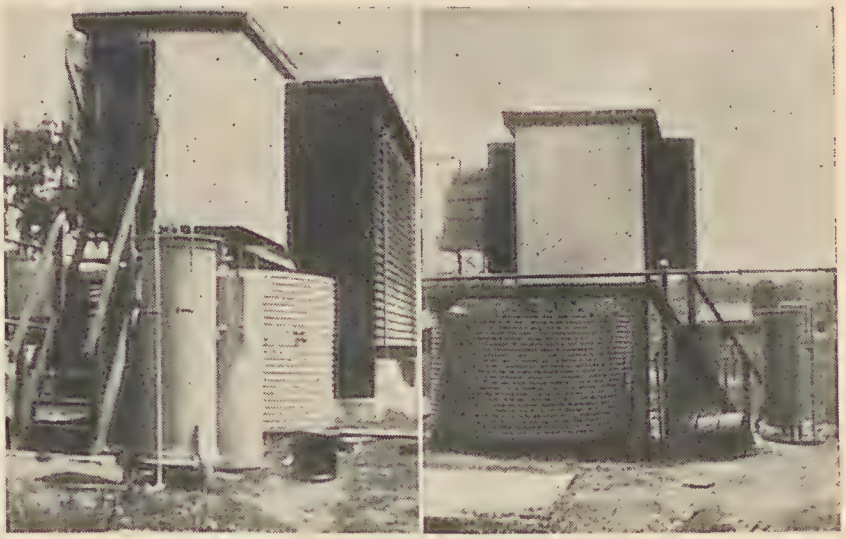
Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
J. L. Fry, Clematis Stud Poultry Farm, 858 Heidelberg-road, Alphington	10.2.43	49
M. A. Jones, Ringwood	22.2.43	352
Reformatory Prison, Castlemaine	3.3.43	299
F. W. Becker, Follett-road, Cheltenham	4.3.43	293
Mrs. C. Penn, Mayfield Poultry Farm, 53 Cromer-road, Beaumaris	15.3.43	527
Ridge and Son, Blackburn	17.3.43	682
Mrs. W. Davidson, Sherbrooke-avenue, Ringwood	24.3.43	103
Anthony Hamilton, "Lyncroft," Flinders	24.3.43	995
John J. King, New Gisborne	24.3.43	48
C. P. Salathiel, Hewitt's Poultry Farm, Skene-street, Bendigo	24.3.43	514
Stanley Wohlers, Box 12, Jung	24.3.43	199

Purification of Water Supplies for Butter Factories

By T. M. JENSEN, B.Agr.Sc., Principal, School of Dairy Technology and Dairy Research Institute, Werribee, and W. S. Curteis, Associate, Royal School of Mines (London).

FOR the manufacture of high quality butter a plentiful supply of pure water is a necessity. Where a natural supply of suitable quality is not available the dairy company is faced with the problem of converting an unsatisfactory water into one suitable for the various uses to which water is put in the factory. This can usually be accomplished without great difficulty (though not without a certain cost) by adopting a suitable method of water treatment or purification. As a rule, the cost of treatment will be small compared with the benefits to be derived and to defer the installation of a proper system of water treatment because of the initial outlay involved, will generally prove to be a shortsighted policy and a costly one in the long run. On the other hand, improperly controlled treatment or the adoption of a system which is improperly adapted to the needs of the water is a sheer waste of money and may only intensify the harm instead of reducing it. Many characteristics of a water supply may affect its suitability for dairy factory use and each supply will usually present its own particular problem. It therefore becomes necessary to consider what exactly are the requirements in a water supply suitable for dairy factory use, in what respects natural supplies may be defective, and how these defects may be overcome by suitable methods of treatment.



Water purification plant at a Queensland butter factory.

Left : End view showing deodoriser (nearest the camera). Immediately behind the deodoriser is the filter.

Right : Side view of plant. Aerator is seen on the left, adjoining the house.

Requirements in a Water Supply Suitable for Dairy Factory Use

The principal uses to which water is put in a butter factory are for washing butter, washing equipment and floors, and for boiler-feed purposes. Objectionable ingredients in water for these purposes are silt or suspended matter (turbidity), colour, undesirable micro-organisms, obnoxious tastes or odours due to algae, weed-growth or other causes, and hardness due to the presence of mineral salts.

For washing butter and for rinsing equipment it is particularly important that in addition to being clear, odourless and free from suspended matter, the water should be free from micro-organisms capable of causing taints or other defects in the butter. Reference is frequently made by dairy technologists to the need for using pure water at the farm dairy in order to safeguard the quality of cream, but it will be obvious that while such advice is perfectly sound, the need for pure water at the factory is even more urgent than it is on the farm. Bacteria which gain entrance to cream on the farm will be mostly destroyed and their harmful effects arrested when the cream is pasteurized, but those which gain entrance to the product

in the factory after the cream has been pasteurized will remain as potential sources of trouble until the time the butter is consumed. Many types of bacteria, it is true, are unable to grow well in salted butter, especially if it is held at a low temperature and are therefore incapable of affecting the quality of the butter even though they may be present in large numbers; but this is not so in the case of certain types commonly found in water supplies. So long as the water in the butter remains unfrozen these water bacteria are able to grow and, under certain conditions, to cause very offensive taints. The most notorious example of the bacteria in this group is *Pseudomonas Putrefaciens* the organism responsible for the very objectionable "putrid" or "rabbito" defect in butter.

The only way of determining the hygienic quality of a water supply for butter-washing purposes is to submit samples at frequent intervals for bacteriological analysis. Even when this is done there may be some difference of opinion as to what should be regarded as a suitable bacteriological standard for butter-wash water. Confusion on this point usually arises from failure to recognize that water may be examined by different methods according to the purpose for which it is to be used. In testing the fitness of water for human consumption, for example, the water is examined for pollution by bacteria of intestinal origin, which, if present, indicate the possibility of intestinal pathogenic bacteria getting into the water supply through the same channels. Provided intestinal bacteria are absent little attention is paid within reasonable limits to the number and types of other species present. Butter-wash water must, for obvious reasons, satisfy the bacteriological requirements of a domestic supply, so the usual tests applied to a drinking water must first be used; but freedom from intestinal bacteria does not necessarily imply that the water is free from bacteria capable of causing trouble in butter. Instances where the exact opposite has been the case have been noted on a number of occasions at the Dairy Research Institute, Werribee, where samples of water obtained from various factories using municipal supplies have been found to contain the organisms responsible for the "rabbito" defect in butter.

After proving that a supply complies with the standards required for drinking water the dairy bacteriologist must then examine the water for organisms deleterious to the quality of butter and especially for those capable of causing defects at storage temperatures. Conclusions regarding the quality of a supply should never be based on the results of a single examination and even a series of favourable results at one period of the year should not be taken as a guarantee that the quality will remain satisfactory at other periods of the year. Taking into account the widespread occurrence of harmful bacteria in water supplies in this country and the difficulties connected with keeping a regular and adequate check on the bacteriological quality of butter factory water supplies, it would seem that there is much to be said for the suggestion that wash water purification should be regarded as just as essential a feature of the butter manufacturing process as cream pasteurization, notwithstanding favourable tests on the raw water supply at any particular time. If this idea were accepted by butter factories, one of the most potent sources of trouble with butter-keeping quality would be eliminated at trifling cost.

For boiler-feed water and washing-up purposes further rather exacting requirements in the water supply must be fulfilled. Among the better known of these is the necessity for a low content of the mineral salts responsible for the condition known as hardness in water. Elimination of these salts from the water avoids the formation of scale in the boilers, hot-water pipes, &c., and facilitates the washing operations in the factory while economizing in the expenditure of cleaning compounds and soap. Hardness determinations made by the Dairy Research Institute on samples of water collected from factories throughout the State have indicated that in many instances treatment of supplies for the removal of hardness would be distinctly beneficial.

Another important requirement in boiler-feed water for butter factory use which appears to be less well recognized, has arisen out of the recent widespread introduction of direct-steam vacuum pasteurizers for the treatment of cream for buttermaking. Unlike the earlier types of pasteurizer in which the heating of the cream was effected by the transference of heat through a metal liner separating the steam from the cream, the modern vacuum pasteurizer operates on the principle of heating the cream by direct admixture with steam in a chamber which is kept under controlled vacuum. Owing to the well-known property of butterfat in rapidly absorbing any odour with which it comes in contact, it is most essential that the steam admitted to this type of pasteurizer should be devoid of odour if damage to the flavour of the cream passing through is to be avoided. Any taint carried by the steam will be picked up by the cream and since it will be absorbed by the

butterfat portion it will be present later in an intensified condition in the butter itself. Consequently, steps must be taken to ensure that the water used for boiler-feed purposes is free from any substance which will cause a taint to be carried over in the steam.

That the importance of this matter has not been adequately recognized at some factories where direct-steam pasteurizers have been installed was shown recently during the course of an investigation carried out by the writer in some commercial factories. Several companies which for some time have been producing butter characterized by a distinctive taint variously described by butter-graders as "chemical taint," "smoked bacon flavour," or "foreign flavour" were found to be drawing their boiler-feed supplies from dams, ponds, or streams containing much weed growth and decomposing vegetable matter. The water was turbid in appearance, disagreeable in flavour, and samples tested in the laboratory yielded steam characterized by a strong taint similar to that experienced in the butter. Various deodourization treatments were tried both on the steam and on the water itself and recommendations for a suitable method of treating the water prior to using it in the boilers were finally made to the dairy companies.

In addition to the undesirable features already enumerated, natural water supplies may also cause trouble on occasion by depositing dissolved iron on any surface with which the water comes in contact or by acting corrosively on boiler plates and metal fittings owing to the water having an excessively acid reaction. In extreme cases the latter condition may lead to "red water" troubles in boilers and pipe lines.

Methods of Treating Natural Waters

It will be evident from the part played by the water supply in butter factory operations that the matter is one deserving close attention from factory managers. The first step towards securing a supply of good standard is to obtain an accurate assessment of the quality of the existing supply by submitting samples for frequent bacteriological and chemical analysis. If alternative supplies are available these should also be tested to afford a proper comparison of their qualities. Sometimes it is possible to effect considerable improvement in the quality of a natural water merely by protecting its source from various kinds of drainage or surface water. In other cases protection of this kind may not provide a satisfactory solution and purification of the existing supply by a suitable form of treatment becomes necessary.

The method of treatment to be applied to the water will depend upon which of the previously mentioned troublesome ingredients have to be removed. Aeration has the effect of oxidizing and removing certain forms of dissolved iron and other ingredients. Filtration will remove turbidity and colour and the majority of the micro-organisms. Softening is necessary to remove hardness, deodourization to remove taste or smell and chlorination to kill micro-organisms. In some cases it is necessary to apply all the above-mentioned treatments to a raw water to secure a satisfactory supply, but in the majority of instances, only one, or perhaps two, of the methods are necessary to obtain a good water for use in the factory. Before proceeding to outline the commoner forms of corrective treatment applied to water supplies it should be stressed that the matter of the proper treatment to adopt should be the subject of advice from competent water technologists who, as a rule, are prepared to guarantee that the desired results will be achieved from the method of treatment recommended.

Aeration

Certain underground waters obtained from wells and particularly from bores, contain appreciable quantities of dissolved iron and possess a marked "irony" or "inky" taste. Such water as this is often acid in its reaction and aggressive to pipes, boiler plates and other metal with which it comes in contact. Contact with air will often precipitate much of this iron in the form of a soft rusty deposit which, being slow in settling, is carried along with the water, which appears cloudy looking and rusty coloured in consequence, into tubs, tanks, boilers, &c., where its presence is obnoxious in many ways.

Efficient aeration can only be effected by passing the water through a properly designed aerator where as much as possible of the water will be brought into contact with air, and by filtering out the deposited iron. Frequently, it is also necessary to correct the filtered water for acidity before it is allowed into the factory supply system thereby avoiding corrosion of the pipes, boiler, and other metal equipment.

Coagulation and Filtration

Water which has been aerated as above should be filtered to secure a satisfactory factory supply. All turbid or coloured water should likewise be filtered. Both turbidity and colour are measured in parts per million and when the turbidity of the raw water exceeds 300 parts per million it should be given preliminary chemical treatment

in a settling tank before filtration. Any such settling or sedimentation tank must be properly designed to secure satisfactory results and the chemical treatment of the water must be applied before admission to this tank, in a suitable mixing tank of smaller capacity in which gentle agitation for periods up to half an hour is frequently an advantage. The treatment normally applied consists in dosing the raw water with sulphate of alumina in some suitable form such as Filter Alum, a chemical specially manufactured for water treatment purposes. This results in the precipitation of a flocculent precipitate—a "floc" of aluminium hydrate which has the property of absorbing colouring matter, collecting turbidity, and entangling bacteria.

The dosed water carrying this floc passes to the filter where it is collected on the upper portions of the graded bed of sand and gravel, which is employed as the filtering medium, the clear filtered water flowing through the filter bed being collected and delivered to the storage tanks, or wherever required. The rate per square foot of surface area of the filter bed at which this water is passed through the filter is important and it is therefore essential that a rate control valve be fitted to the filter to ensure that the proper filtration rate is not exceeded.

As the floc accumulates on the filter bed it imposes a gradually increasing resistance to the passage of the water through the bed with the result that the pressure difference, or loss of head as it is termed, between the upper and lower parts of the filter bed also increases and the capacity of the filter is reduced. It is therefore necessary to back-wash the filter at intervals and in order to maintain the filter in good condition only filtered water should be used for this purpose.

With the ordinary single type of filter it is necessary to provide a supply of filtered water in a wash water tank at a suitable height above the filter and to ensure that an adequate supply is always available in this tank to wash the filter when this is required. This system has the disadvantage that in addition to the expense of providing the wash water tank, the water stored in this way is liable to become polluted and when used to wash the filter it is liable to infect the sand in the filter bed thus, to some extent, defeating the object of the filter. In the modern multiple type of filter these disabilities have been overcome by dividing the filter bed into a number of sections or units, which during filtration operate as a whole, but when being washed operate individually, thus enabling the filtered water being delivered by all units except one to be used for washing the remaining unit; this process is repeated in rotation until all the units have been washed, when the filter is once more put back into normal filtering. In this manner the need for a filtered water storage for washing purposes is eliminated and the filtered water used in washing is obtained fresh, being continually generated by the filter during the wash. Filters of this type can be made fully automatic and where sufficient storage capacity is available the fully automatic filter can be kept operating over the full 24 hours thus enabling the size of the filter to be considerably reduced.

Softening

Certain natural waters, particularly those from underground sources, such as well and bore waters, carry appreciable amounts of the salts of lime and magnesia and frequently they contain silica as well. Such waters, when it is attempted to obtain a lather with soap, give more or less of a "curd" of lime and magnesia soaps which are insoluble in water, and are commonly referred to as "hard." Hardness in water is made up of temporary hardness and permanent hardness. Temporary hardness is due to the presence of bicarbonate and when the water is boiled carbon dioxide is evolved whereby the bicarbonates are converted into the insoluble carbonates, which are deposited on the walls of the vessel in which the boiling takes place, forming a scale, while the hardness of the water is correspondingly reduced. Permanent hardness is due to the presence of sulphates of lime and magnesium which are not altered by boiling and remain in solution. Nevertheless they also form a scale when steam is evaporated, due to their higher concentration in the remaining water. When this exceeds a certain limit they are similarly deposited on the walls of the vessel in which evaporation is taking place.

When silica is present in water it does not necessarily impart hardness to it, but on evaporation it is left on the walls of the vessel in which the evaporation is carried out as a very hard dense scale which is difficult to remove. It is consequently very desirable to remove silica from any water which is used in steam boilers.

Another salt which imparts hardness to water is sodium chloride, or ordinary common salt. This cannot be removed by any present known economical method of softening, and although it is harmless as far as butter-making is concerned, it is not desirable in boiler water. It does not form a scale but its gradually increasing concentration in a boiler necessitates

greater frequency of blow down to avoid its being deposited from solution in the form of a "sludge", which readily settles and may cause undue heating and buckling of plates.

There are two methods commonly used for softening water. The first of these is known as the Base Exchange method and the other as the chemical precipitation method. The choice of which method to adopt to obtain the best results is dependent upon the nature of the dissolved solids in the particular water it is required to soften, and to a certain extent on the relative cost of treatment by either process. For the base exchange method, the ideal water is one which is always free of turbidity and in which the dissolved solids are mainly the carbonates and sulphates of calcium and magnesium, with silica either absent or present in very small amounts. The chemical precipitation method has a wider range of application, as by this method not only the calcium and magnesium salts, but silica also can be removed. In addition it is more flexible where the contents of the water vary from time to time. This variation is a characteristic of rivers and creeks which flow through limestone or similar country, the hardness of the water varying according to the flow, being greatest at low flow and lowest at high flow. The turbidity in such cases varies in opposite ratio, and the plant can take care of this turbidity also. In a base exchange plant any turbidity tends to choke the base exchange material and thus decrease the efficiency of the plant.

The base exchange method of softening consists in passing the hard water through a bed of material, consisting of a double silicate of aluminium and sodium, which has the property of abstracting the calcium and magnesium from their combinations in the water and replacing them by sodium. Thus the water is softened by converting the calcium and magnesium carbonates and sulphates into sodium carbonate and sodium sulphate, the base exchange material itself being converted at the same time into the double silicates of aluminium with calcium and magnesium. Obviously, when all the base exchange material has been so converted, it can have no further softening effect on the water, and it is therefore fortunate that it can be easily regenerated for further use. This is effected by passing a brine solution through it and running to waste. The sodium in the brine replaces the calcium and magnesium in the base exchange material, thus once more making it available for softening, while at the same time the brine itself is converted into a solution of calcium and magnesium chlorides which is run to waste. The cost of treatment by this method will depend upon the cost of salt and the amount of hardness in the water, to which the salt consumption will be directly proportional.

The apparatus used in this method consists of a shell similar to a filter, a brine tank and the necessary valves and pipes to ensure the flow of hard water to the softener, the admission of brine for regenerating when required, the delivery of the softened water and the discharge of the spent brine to waste. Semi-automatic and automatic softeners in which the operations of shutting off the hard water, admitting the brine and discharging the spent brine to waste, &c., are carried out automatically, can be obtained. These are naturally more expensive than the ordinary kind, in which these several operations are carried out manually.

The chemical precipitation method consists in dosing the hard water with the chemical required and admitting the dosed water into a settling or sedimentation tank which has sufficient capacity to ensure that time is allowed for the reaction to be carried to completion. Essentially, the apparatus is similar to that used in treating a raw water of turbidities over 300 p.p.m. and the subsequent treatment should consist similarly in filtration of the softened and settled water before it is used in the factory. Usually the chemicals can best be added by dry feed machines, but wet feeders may be used in certain cases. The chemicals mainly used are hydrated lime and soda ash, but recently the use of sodium aluminate has extended considerably. The latter chemical has the advantage that it hastens the reaction time and thus reduces the size of the tank required, as well as having the property of removing silica, if such is present in the water—a very considerable advantage over the old lime-soda method. Another advantage of sodium aluminate is that it will form a floc with turbidity, either alone or in conjunction with filter alum thus enabling the plant to be adapted to varying conditions of the raw water.

Deodorization

In addition to the other possible objectionable features of a natural water supply, weed growth and algae may be prevalent, particularly in warm weather to a sufficient extent to cause very disagreeable tastes and odours in the water. The effect of water of this type upon the quality of steam used for direct-steam pasteurization of cream has already been discussed.

This odour or taste is largely eliminated by the filtration process described above, but it may be present to such a degree that ordinary filtration will not entirely remove it. In such cases it is necessary to resort to deodourization by the use of activated carbon if the taste is not to be transferred to the butter.

There are two methods by which this may be carried out dependent upon the type of plant needed for any other treatment the water requires. If a sedimentation tank is provided, pulverized activated carbon can be used and fed in by means of a dry feeder. If no sedimentation tank is required, the filtered water is passed through a deodouriser, which consists of a shell somewhat similar to a filter but provided with a bed of granular activated carbon, the water preferably traversing the bed in an upward direction.

In the first case the activated carbon used is lost in the process and although the amount required is comparatively small, the material is fairly expensive. In the second case the absorptive power of the activated carbon is gradually diminished by use, but it can be regenerated by passing live dry steam through it and in this way it can be made to last for a considerable time. After some number of regenerations, it becomes markedly less active and has to be replaced with a fresh charge of activated carbon, so that in this case as well there is a certain amount of loss.

Activated carbon has very considerable absorptive properties, not only for taste and odour, but also for colouring matter and turbidity. As the latter much more rapidly decrease its efficiency it should never be used purely to remove them, as this would represent a much more expensive method of clarification than the usual treatment of the water with floc forming chemicals and filtration. Its use should be restricted to the removal of taste and odour, the prior removal of turbidity and colour as well as some of the taste and odour being effected by filtration, as in this way the consumption by activated carbon is reduced to a minimum.

Chlorination

Free chlorine even in quantities as small as 0·1 parts per million is fatal to most forms of bacterial life in water and it is chiefly for this reason that it is used in water supply schemes. Chlorine is a very active oxidizing agent and the dose of chlorine required to secure sterilization is dependent upon the quantity of readily oxidizable matter present in the water, rather than upon the actual number of bacteria it contains. In sterilizing water by the use of chlorine the aim must therefore be to satisfy the "chlorine demand" of the water and leave a small residual of free chlorine present in the treated water. Water which is heavily loaded with organic matter will consume much larger amounts of chlorine than will clear water and for satisfactory results such water should really be filtered before chlorination. Another condition for satisfactory chlorination is that the chlorine should be in contact with the water for a period of at least 30 minutes before the water is used. Failure to recognize the need for a minimum period of contact may result in incomplete sterilization of the water.

Many different means are employed to secure the presence of free chlorine in a water supply although the result is the same in each case. Bleaching powder, sodium hypochlorite, high test calcium hypochlorite under different trade names and liquid chlorine are all employed. Sodium hypochlorite is a liquid and has the advantage that it is easily handled and measured. It may be fed to the water by the use of various types of small solution chemical feeders or it may be added manually. Liquid chlorine, however, has the advantage that it is the cheapest form in which chlorine may be purchased and it is more convenient than other forms where other than very small quantities of chlorine are required. Its use requires the assistance of an instrument known as a Chlorinator which converts the liquid chlorine to the gaseous state, reduces the gas to a constant pressure, meters the flow of the chlorine gas at constant pressure, absorbs the metered chlorine gas in water and applies the aqueous solution of chlorine gas for the purpose required. The Chlorinator is usually connected with the water supply main in such a way that turning on the water supply automatically brings it into action, while similarly it is automatically stopped by shutting off the water supply. Whatever method of chlorination is adopted by the butter factory it is most desirable that the treatment should be applied to the whole of the water entering the factory. This ensures not only that the butter wash-water is of suitable quality but also that the water used for rinsing churns and equipment is of similar standard—an equally important consideration.

Cost of Water Purification.

The cost of installing suitable plant to treat the water supply to a factory will naturally depend on the amount of water to be treated

[*Continued on page 202.*

Burnley Egg-Laying Competition

Final Results, 1942-43

By H. F. CLINTON, Poultry Expert

THE thirty-second Egg-laying Competition for fowls, conducted at the Burnley School of Primary Agriculture and Horticulture, commenced on 1st April, 1942, and concluded on 2nd March, 1943.

The competition continues to be well supported by breeders.

Owing to the man-power situation, the Department was forced to limit the competition to Section "B"—Individual Birds, Single Test, eliminating Section "A"—Groups of six birds—trap-nested.

The whole of the accommodation in Section "B" was filled, consisting of 236 pens, providing a pen for each bird.

It is pleasing to note that for the forthcoming Single Test Burnley Competition, 1943-44, many more applications were received than could be accepted for the accommodation available. This support indicates that the value of this competition is appreciated by breeders.

The beneficial effect of the competition on the industry as a whole is becoming widely appreciated by poultry farmers. The introduction to commercial poultry farms of the progeny of birds which have distinguished themselves at Burnley has greatly improved the quality of flocks generally, and has helped to maintain the bulk of eggs produced, at the standard first-grade size.

Although at the end of the 48 weeks no bird had laid a sufficient number of eggs to enable it to qualify for retention for the full twelve months in an attempt to break the present Burnley record, some very good scores were recorded.

The Burnley Competition commenced in 1911, and the highest twelve months' record for a single bird of any breed since the commencement was made by an Australorp entered by Mr. F. W. Becker in the 1940-41 competition. This bird laid a total of 340 first-grade eggs in 52 weeks, and 312 in 48 weeks.

This Australorp owned by Messrs. Sweeney Bros. gained first place in the Competition with a score of 290 first-grade eggs, the highest individual total.

In the 48 weeks' competition just concluded, the best performance was that of an Australorp, owned by Messrs. Sweeney Brothers. This bird laid 290 first-grade eggs, the highest score in all classes of the competition. An Australorp entered by Mr. T. J. Crewther laid a very creditable total of 284 first-grade eggs. In White Leghorns, a good score was achieved by a bird in the Dry Mash Class owned by Mr. A. Martin. This bird laid 286 first-grade eggs. In the Wet Mash Class, a bird owned by Messrs. J. and B. Gibbs laid a good total of 278 first-grade eggs. A Rhode Island Red owned by Mr. J. Chatts laid 262 eggs, all first grade, a very good score for this breed, while Mr. J. Granter's White Wyandotte laid a total of 225 first-grade eggs.

In the class for Rhode Island Reds, 34 birds competed. Unfortunately, a number of applications to enter birds of this breed could not be accepted, because of the elimination of Section "A."

Left—White Leghorn owned by Messrs. J. and B. Gibbs. This bird gained 1st prize in the wet mash section with a total of 278 first-grade eggs. Right—Mr. A. Martin's White Leghorn, winner of the dry mash section with 286 eggs, all first-grade.

The mortality among the competing birds was 6·4 per cent. No birds died from heat apoplexy. As it is in the interest of all poultry breeders to improve their flocks and reduce mortality, competitors should exercise special care in the selection of the stock used to produce birds for egg-laying competitions, and breed only from those possessing a high degree of constitutional vigour.

In the competition, prize certificates and sashes were awarded for the greatest number of first-grade eggs laid. During the first two months of the competition a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

At Burnley, every egg is weighed to one-tenth of an ounce. The records are available for examination by any competitor.

The Awards

Section B.—Individual Birds—Single Test.

In the class for White Leghorns fed on wet mash, first prize was won by Messrs. J. and B. Gibbs with a bird that laid 278 first-grade eggs.

TABLE SHOWING MONTHLY LAYING RETURNS.

Section B.

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
April	126	1,819	14·4	6	14	2·3	60	975	16·2	44	446	10·1
May	125	1,937	15·5	6	41	6·8	60	1,052	17·5	43	412	9·5
June	124	1,776	14·3	6	79	13·2	60	1,152	19·2	43	506	11·7
July	124	1,700	13·7	5	92	18·4	60	1,223	20·4	43	604	14·0
August	124	2,445	19·7	5	93	18·6	60	1,311	21·8	42	809	19·2
September ..	124	2,741	22·1	5	96	19·2	60	1,326	22·1	42	996	23·7
October	124	3,194	25·7	5	92	18·4	60	1,299	21·6	41	903	22·0
November ..	124	2,758	22·2	5	77	15·4	60	1,154	19·2	41	858	20·9
December ..	123	2,796	22·7	5	66	13·2	59	1,099	18·6	41	780	19·0
January	122	2,231	18·2	5	64	12·8	58	929	16·0	41	745	18·2
February ..	120	2,475	20·6	5	57	15·4	55	795	14·4	41	624	15·2

A bird entered by C. and K. Langdon followed closely for second prize, with a total of 273 eggs. In addition to first prize, Messrs. J. and B. Gibbs also secured third prize, with a bird that laid 266 eggs.

In the White Leghorn class, fed on dry mash, first prize was won by Mr. A. Martin, and he was also awarded a second prize Burnley Sash, with a bird that laid 286 first-grade eggs. Second prize went to the Lenham Poultry Farm (Mr. F. Smith), with a total of 269 eggs. In addition to first prize, Mr. A. Martin also secured third prize, with a bird that laid 261 eggs.

In the class for Australorps, Messrs. Sweeney Brothers won first prize, and they also gained a first prize Burnley Champion Sash, with a bird that laid 290 eggs, all first grade, the highest score in all classes of the competition. Mr. T. J. Crewther followed closely for second prize, and he was also awarded a third prize Burnley Sash, with a bird that laid 284 eggs. Mr. Crewther also secured third prize with a bird that laid 273 eggs.

In the class for Rhode Island Reds, Mr. J. Chatts won first prize with a bird that laid 262 eggs, all first grade. Mr. L. B. Bryan followed closely for second prize with a bird that laid 256 eggs, and Mr. C. L. Macpherson obtained third prize with 244 eggs.

The winning Rhode Island Red owned by Mr. J. Chatts. This bird laid 262 first-grade eggs.

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD.

Section A.

Breeds.	Number of Birds After Allowing for Deaths.	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		First Grade.	Under-weight.	Total.	First Grade.	Under-weight.	Total.
LIGHT BREEDS—WET MASH—							
White Leghorns	83	17,699	309	18,008	213·2	3·7	216·9
Other Breeds	5	760	11	771	152·0	2·2	154·2
TOTAL LIGHT BREEDS—WET MASH	88	18,459	320	18,779	209·7	3·6	213·3
LIGHT BREEDS—DRY MASH—							
White Leghorns	41	7,500	374	7,874	182·9	9·1	192·0
TOTAL LIGHT BREEDS—WET AND DRY MASH	129	25,959	694	26,653	201·3	5·3	206·6
HEAVY BREEDS—WET MASH—							
Australorps	59	12,188	127	12,315	206·5	2·2	208·7
Island Reds	32	5,668	221	5,889	177·1	6·9	184·0
Other Breeds	10	1,576	218	1,794	157·6	21·8	179·4
TOTAL HEAVY BREEDS	101	19,432	566	19,998	192·4	5·6	198·0
TOTAL ALL BREEDS	230	45,391	1,260	46,651	197·4	5·4	202·8

Mr. J. Granter's White Wyandotte which laid 225 eggs, all first-grade.

In the class for All Heavy Breeds, other than Australorps and Rhode Island Reds, Mr. J. Granter won first prize with a White Wyandotte that laid 225 eggs, all first grade.

Cost of Feeding, &c.

There were 236 Fowls in the competition at its commencement, but fifteen died. The total number of days these latter birds collectively were in the pens was 3,149, which is equal to approximatelly nine birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 230, and this is the figure used in working out averages, &c.

The different kinds and quantities of food fed to the birds during the currency of the competition were as follows:—Wheat, 9,575 lb.; hulled oats, 3,471 lb.; cracked maize, 2,093 lb.; bran, 5,688 lb.; pollard, 9,947 lb.; meatmeal, 78 lb.; dried whey, 86 lb.; dried buttermilk, 91 lb.; meat, 345 lb.; onions, 107 lb.; grit, 1,300 lb.; salt, 75 lb.

The total number of eggs laid, including those under-weight, was 46,651, an average per bird of 202·8 for the 48 weeks.

The price realized for the eggs averaged a fraction under 1s. 7¾d. per dozen. The market value of the eggs averaged £1 6d. 2¾d. per bird and the cost of food averaged 13s. 4d. per bird, a fraction over 3·3d. per week; thus, the return over cost of food for 48 weeks averaged 12s. 10¾d. per bird. The prices received for the eggs, however, are exclusive of freight or commission charges, &c. Also, it must be remembered that the eggs were laid by pullets in their first year of production, kept in single pens, the conditions being entirely different from those on commercial farms, where birds of various ages are kept in large flocks.

Prize List—1942-43

SECTION B.—INDIVIDUAL BIRDS,—SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
21	J. and B. Gibbs, c/o 24 Sycamore-street, Hartwell	280	2	278
	Second Prize—Government Certificate.			
36	C. and K. Langdon, Bullock Swamp, Colac	278	5	273
	Third Prize—Government Certificate.			
22	J. and B. Gibbs, c/o 24 Sycamore-street, Hartwell	266	..	266
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate, also Second Prize—Burnley Sash.			
218	A. Martin, 23 Clonaig-street, Brighton East, S.6	287	1	286

Section B.—Individual Birds—Single Test—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 2.—White Leghorns—Dry Mash—*continued.*			
	Second Prize—Government Certificate.			
211	Lenham Poultry Farm (F. Smith), Terang	271	2	269
	Third Prize—Government Certificate.			
217	A. Martin, 23 Clonaig-street, Brighton East, S.6	266	5	261
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate, also Burnley Champion Sash.			
130	Sweeney Bros., Ararat ..	290	..	290
	Second Prize—Government Certificate, also Third Prize—Burnley Sash.			
97	T. J. Crewther, Carlow-street, East Bentleigh, S.E.15	285	1	284

Section B.—Individual Birds—Single Test.—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 4.—Australorps—Wet Mash—*continued.*			
	THIRD PRIZE—GOVERNMENT CERTIFICATE.			
98	T. J. Crewther, Carlow-street, East Bentleigh, S.E.15	273	..	273
	Class 5.—All Heavy Breeds other than Australorps and Rhode Island Reds—Wet Mash.			
	FIRST PRIZE—CHAMPION CERTIFICATE.			
156	J. Granter, 163 Martin-street, Gardenvale, (White Wyandotte)	225	..	225
	Class 5.—Rhode Island Reds—Wet Mash.			
	FIRST PRIZE—CHAMPION CERTIFICATE.			
194	J. Chatts, White-street, Beaumaris	262	..	262
	SECOND PRIZE—GOVERNMENT CERTIFICATE.			
161	L. B. Bryan, 58 Yarralea-street, Alphington, N.20	258	2	256
	THIRD PRIZE—GOVERNMENT CERTIFICATE.			
178	C. L. Macpherson, 19 Oates-street, Frankston	246	2	244

SECTION B.—FIRST CLASS CERTIFICATES OF MERIT TO HENS IN CLASSES 1, 2, AND 4 WHICH LAID 240 FIRST GRADE EGGS, AND IN CLASSES 3 AND 5, WHICH LAID 220 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.	
49	J. R. Maddison, Red Cliffs P.O. ..	261
56	M. Martin, 23 Clonaig-street, Brighton East, S.6	259
16	T. J. Crewther, Carlow-street, East Bentleigh, S.E.15	258
30	A. Johnson, Sunray-avenue, Cheltenham	258
52	L. Magnusson, Nathalia P.O.	257
28	A. Hewett, Central-avenue, Bayswater ..	255
46	A. McIlvain, 24 Harbury-street, Reservoir, N.19	254
24	A. J. Glanfield, 132 Separation-street, Northcote, N.16	253
53	A. Martin, 23 Clonaig-street, Brighton East, S.6	251
66	Sweeney Bros., Ararat	251
54	A. Martin, 23 Clonaig-street, Brighton East, S.6	250
1	J. Armstrong, 657 Bell-street, West Preston, N.18	249

Section B.—First Class Certificates of Merit—*continued.*

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash—*continued.*	
13	W. J. Cooke, 8 Mount-street, West Preston, N.18	248
17	A. T. Dent, "Ridgeway," Sellars-street, Greensborough	247
41	S. J. Lethlean, Epping P.O.	247
47	K. A. McLaughlin, Central-avenue, Bayswater	246
3	T. B. Arnott, 122 Gardenvale-road, Gardenvale	244
35	C. and K. Langdon, Bullock Swamp, Colac	243
51	L. Magnusson, Nathalia P.O.	242
58	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	242
78	E. Abikhair, 41 Wilfred-road, Ivanhoe, N.21	242
55	M. Martin, 23 Clonaig-street, Brighton East, S.6	241
	Class 2.—White Leghorns—Dry Mash.	
227	Tarara Poultry Farm (B. Sweeney), 55 Rundle-street, Ararat	252
220	M. Martin, 23 Clonaig-street, Brighton East, S.6	250
222	V. R. P. Milligan, State School No. 3426, Ultima	246
214	S. J. Lethlean, Epping P.O.	242
	Class 4.—Australorps—Wet Mash.	
117	A. McIlvain, 24 Harbury-street, Reservoir	263
108	C. E. Graham, Portarlington	262
93	A. and L. Caspar, Main-street, Bacchus Marsh	261
105	A. J. Glanfield, 132 Separation-street, Northcote, N.16	261
116	F. G. Julyan, 460 Pt. Nepean-road, Brighton East	260
147	E. A. Head, 38 Serrell-street, East Malvern, S.E.5	258
125	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	258
99	T. L. Eastaugh, Pt. Nepean-road, Highett, S.21	257
96	Mrs. J. T. Cornish, Healesville	256
104	J. and B. Gibbs, c/o 24 Sycamore-street, Hartwell	252
148	E. A. Head, 38 Serrell-street, East Malvern, S.E.5	240
	Class 5.—Rhode Island Reds—Wet Mash.	
172	J. W. Hattwell, 44 Ebden-street, Elsternwick	243
171	,, ,, ,, ,, ,,	241
162	L. B. Bryan, 58 Yarralea-street, Alphington, N.20	237
170	A. J. Glanfield, 132 Separation-street, Northcote, N.16	235
182	A. Perkins, 5 Eastgate-street, Pascoe Vale South	221

HELP AUSTRALIA—INVEST IN THE THIRD LIBERTY LOAN

FIELD INVESTIGATIONS WITH FLAX

By J. McC. McCANN, B.Agr.Sc., Science Field Officer

WITH the rapid expansion of flax-growing throughout Victoria the need was felt for the establishment of experimental plots in areas not previously served.

Prior to 1942, experiments with flax were conducted at Strathkellar, Colac, Drouin, and at the Rutherglen Experiment Farm. These were continued in 1942, when additional trials were initiated at Myrtleford, Lindenow, Riddell, and Ballarat. The seven districts in which these experiments were conducted, are dispersed widely amongst the flax-growing areas of the State, and in 1942 grew 14,575 acres, or approximately one-half of the total Victorian flax area. When it is realized that flax is grown in so many districts having seasonal conditions varying from excellent to unfavourable, it is not surprising that the results of the experimental plots range from almost record yields down to complete failure.

Top.—A crop of Liral Crown flax in flower. Left.—Hand spreading flax for dew retting. Right.—A reaper-spreader. After the seed has been harvested with a header, this machine, invented in Victoria, cuts and spreads the flax straw to be dew retted. - - - Lower.—General view of water-retting mill at Myrtleford.

The Strathkellar plots were sown in the first week of June on land ploughed from a long-term pasture on 7th May. The latter month was extremely wet, and it was only by taking advantage of a short break early in June that sowing was possible. In the five months May to September, 20·14 inches of rain was recorded, with an average of 22 rainy days per month. The plots were well advanced before a dry spell in October accelerated their development, and good November rains provided favourable finishing conditions, the average yield approximating 2½ tons per acre.

The Colac plots were sown on a well-prepared site ploughed from a subterranean clover and rye grass pasture late in May. The germination, however, was very poor and bare patches developed which rendered the plots useless as yield trials. The thinning out of the stand and patchiness were caused by cockchafer grubs.

A very favourable season was experienced at Drouin. The paddock from which the plot site was ploughed had been in pasture over twenty years, and for the last five or six years was topdressed with a bag of superphosphate per acre. Under such conditions it was not surprising that the flax plots lodged badly and did not recover for harvest, making it necessary to hand-pull the crop to obtain reliable results.

The Riddell plots suffered from an adverse season. Heavy rains in May prevented sowing at the normal time, and showers further delayed sowing until the end of July. The spring rains would have been sufficient for flax sown at the normal time, but the plots finished when very short, weeds became bad, and a heavy attack of rust damaged the straw.

At Lindenow, conditions were even worse. In the six months from April to September only 5·38 inches were recorded, while the average for the same period is 11·84 inches. The June sowing made very poor growth and had practically finished before average rains were received in October. The later sowing benefited by these rains, but was attacked by a plague of cutworms, which not only stripped the seed bolls from the plants, but also chewed the stems and nipped many plants off.

The main sowing at Ballarat was made early in June on a well-prepared site, but growth ceased for a period in July because of low temperatures, and weeds subsequently became bad. The late sowing did not receive such a check, and a cool moist spring enabled them to finish well.

The season, particularly the late spring, was very favourable to flax growth at Rutherglen, the plots made excellent growth and yields were heavy, the main sowing averaging 53 cwt. per acre.

The Myrtleford plots were sown on red hill soil which had been under lucerne for a number of years, followed by two crops of oats and a crop of millet. The land was in excellent order at seeding, but torrential rains fell shortly after, and reduced germination considerably. The plots made fair growth during the remainder of the season, and stood well until harvest.

Investigations in Progress

The main experiments were designed to compare, at different rates of seeding and times of sowing, the two varieties Liral Crown and Concurrent, which are grown on contract areas throughout the State. Other experiments, with Liral Crown as the standard variety, included manurial trials, rolling and method of sowing trials, rotation trials, and seed-pickling trials.

Variety and Rate of Seeding Trial

The variety and rate of seeding trial was sown at Strathkellar, Drouin, and Myrtleford at the request of the Flax Production Committee, so that Liral Crown and Concurrent could be compared under conditions representative of a large proportion of the flax-growing districts of the State. The two varieties were sown at 50, 70, and 90 lb. seed per acre, and each treatment was repeated (or replicated) five times. The rates of seeding were adjusted to allow for differences in seed size, and soon after germination counts were made of the number of plants per foot of drill row for each variety and rate of seeding. These are set out in Table I., and the percentage germination of each variety is also shown.

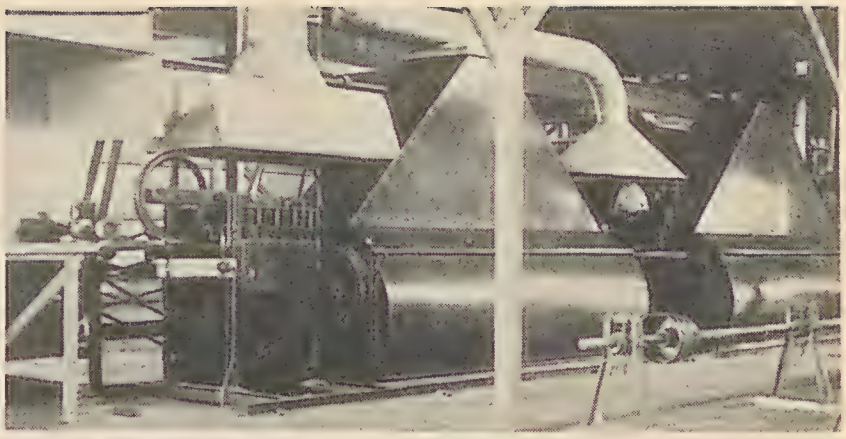
TABLE I.—VARIETY AND RATE OF SEEDING TRIAL.

Plants per Foot, Eight Weeks after Sowing.

Rate of Seeding.	Strathkellar.		Drouin.		Myrtleford.	
	Liral Crown.	Concurrent.	Liral Crown.	Concurrent.	Liral Crown.	Concurrent.
	%	%	%	%	%	%
50 lb. per acre ..	38·1	41·4	41·2	42·5	23·3	29·7
70 lb. per acre ..	47·2	57·7	58·7	54·1	33·1	35·9
90 lb. per acre ..	60·2	69·0	66·7	68·0	37·4	45.5
Percentage germination ..	53·5	61·3	59·3	59·0	37·5	44·2

Water retting tanks, Myrtleford, with gaited straw drying in the foreground.

The germination at Strathkellar and Drouin was good, but setting of the ground because of heavy rains soon after seeding affected the germination at Myrtleford. As the seed of each variety sown in this trial was from the same source it is evident that germination in the field will be influenced largely by soil and climatic conditions at and immediately after seeding. It may be noted that Concurrent germinated better under unfavourable conditions than Liral Crown.



A scutching machine, which separates the fibre from the retted straw.

TABLE II.—VARIETY AND RATE OF SEEDING TRIAL.

Rate of Seeding.	Strathkellar.		*Drouin.		Myrtleford.		Average 3 Centres.
	Liral Crown.	Concurrent.	Liral Crown.	Concurrent.	Liral Crown.	Concurrent.	
	cwt. per acre	cwt. per acre	cwt. per acre	cwt. per acre	cwt. per acre	cwt. per acre	cwt. per acre
50 lb. per acre ..	45·3	49·8	72·8	69·9	27·3	31·2	49·4
70 lb. per acre ..	51·6	50·4	72·6	74·0	32·1	31·8	52·1
90 lb. per acre ..	54·1	50·3	73·6	73·7	30·5	33·6	52·6
Av. three seed rates	50·4	50·2	73·0	72·5	30·3	32·3	..

* plots pulled.

The results given in Table II. show practically no difference in yield between Liral Crown and Concurrent under the conditions which prevailed in 1942, but the tests must be continued for several years in the different districts before one variety can be proved more suitable than the other. The farmer who grows flax wants a variety that will fulfil as many of the following requirements as possible:—

(1) A high yield per acre.
(2) A high value per ton, which demands length of straw.
(3) A variety that is easy to harvest, and will stand up to a wide range of seasonal conditions.
(4) A variety that will cut easily.
(5) In Victoria, a variety that will make good winter growth.
(6) A variety that does not head quickly in dry weather.
(7) Resistance to disease, especially to rust and wilt.

Liral Crown makes better winter growth than Concurrent but has a tendency to rush into head during a dry spell in the spring, which is quite likely to occur in Victoria. Concurrent seems able to withstand a dry period, and is not so readily forced into flower prematurely.

The requirements of the flax miller must not be overlooked, and these may be summarized as follow:—

(1) Fibre of good length.
(2) High fibre quality.
(3) High percentage of fibre.
(4) Uniform straw.

Straw samples were taken from each plot in the Variety and Rate of Seeding Trial and sent to the Division of Forest Products of the Council for Scientific and Industrial Research. There they will go through the same process as straw at a flax mill and be examined carefully at each stage for the above characteristics.

The results of the rate of seeding trial (see Table II.) show considerable variation, but this is to be expected when the optimum rate of seeding depends on the germinating capacity of the seed and soil conditions at seeding. The averages of both varieties at all three centres, however, may be regarded as typical of a wide range of conditions. It will be seen that the recommended seeding rate of 70 lb. per acre is the best under average conditions, with a yield of 2·7 cwt. per acre more than obtained with 50 lb. of seed per acre. The increase of 0·5 cwt. per acre with 90 lb. per acre is obtained at a loss, because of the cost of the extra seed, and although there may be an improvement in quality with the higher seeding rate, the risk of the crop lodging is a definite disadvantage.

Variety and Time of Sowing Trials

Time of sowing is a very important consideration with flax, and it has been demonstrated previously with Liral Crown that in most districts late sowing results in greatly reduced yields.

In tests at Strathkellar for three years results obtained by sowing in June, July, and August have been compared, and in each year the earlier sown flax gave the highest yield. The average figures were:—

	Average yield, 3 Years. Cwt. per Acre.
Sown in June ..	37·3
Sown in July ..	31·7
Sown in August ..	22·4

In districts similar to Strathkellar (Hamilton) and in most flax-growing areas of the State, sowing should be completed by the end of June, provided that soil conditions are suitable before then, which they usually are. Early preparation of the soil is desirable in order that sowing will not be delayed.

In late districts such as Drouin (Warragul) sowing may be delayed until July without much risk of decreased yield, and on rich soils sowing too early may result in the lodging of heavy crops. The average yields per acre obtained in time of sowing trials at Drouin were:—June sowing, 35·6 cwt.; July, 33·9 cwt.; and August, 21·8 cwt. per acre.

Early sowing, having due regard to the control of weeds, suitable condition of the soil and the risk of lodging, is advocated for both the Liral Crown and Concurrent varieties. However, as Concurrent matures later than Liral Crown it will respond better to late spring rains and in suitable seasons may be the better variety for late planting. The time of sowing trials now conducted at several centres include both Liral Crown and Concurrent in order that the response of these two varieties to different times of sowing and the soil and weed conditions related thereto may be investigated over a period of years.

Results in 1942

In 1942 the results at Strathkellar showed little difference between the two varieties, whether sown early or late, both giving much higher yields when sown in June. At Rutherglen Liral Crown, planted in mid-May, yielded slightly better than Concurrent, but both gave approximately the same but much lower yields when sown in early June.

At Ballarat, the planting season was difficult, owing to the wet conditions in May and June. June sowings, including the flax sown in the experiments, received a check owing to the wet conditions. The plots sown early in August gave higher yields of cleaner and taller flax, but these results cannot be regarded as typical of average conditions.

At Drouin there was no significant difference between Liral Crown and Concurrent. At Myrtleford only Liral Crown was sown, but the flax planted in mid-May yielded 37·1 cwt. per acre as compared with 29·7 cwt. from the plots sown early in June. The delay of only two weeks resulted in a reduction in yield of 7·4 cwt. per acre.

Manurial Trials

Responses to superphosphate were obtained at Strathkellar, Ballarat, and Rutherglen, while no appreciable increases in yield were recorded at Drouin and Myrtleford. The Strathkellar and Rutherglen plots in particular showed better growth after the first month on all manured plots, while the "No Manure" plots were consistently backward and slower to mature than the other treatments. The increased growth in the manured plots was maintained until harvest, as shown by the following straw measurements at Strathkellar:—"No Manure," 33 inches; Superphosphate, 1 cwt., 37 inches; Superphosphate, 2 cwt., 39 inches.

TABLE III.—MANURIAL TRIALS, 1942.

Treatment.	*Strathkellar.	*Drouin.	Ballarat.	Rutherglen.	Myrtleford.
No manure ..	38·9	76·8	26·3	50·1	32·8
Super. 1 cwt. ..	54·2	75·7	28·7	59·5	33·9
Super. 2 cwt. ..	60·7	83·9	27·1	63·9	34·0
Super., 1 cwt. + Sulph. of Amm., 1 cwt. ..	55·5	74·3	..	57·9	32·8

* Single plots only.

The lack of response to superphosphate at Drouin, which has been a consistent experience during several years' tests can be attributed to the regular heavy manuring of previous crops in the rotation. The Myrtleford results are surprising, as this country normally shows a remarkable response to topdressing, and it is standard practice to manure other crops.

A well-grown, well-harvested crop of Concurrent. Note the short clean stubble.

TABLE IV.—MANURIAL TRIALS, AVERAGE YIELDS THREE YEARS, 1938-1940.

—	Strath-kellar.	Colac.	Drouin.
	cwt. per acre	cwt. per acre	cwt. per acre
No manure	34·1	18·3	32·1
Super., 1 cwt.	43·2	19·5	31·8
Super., 2 cwt.	46·0	20·8	32·8
Super., 1 cwt. + Sulph of Amm., ½ cwt. ..	45·4	19·6	33·1

Variety Trials

Nine varieties, with Liral Crown as the standard, were sown in replicated trials at Colac and Riddell, but very little evidence on their performance was obtained, because of the complete failure at Colac and the partial failure at Riddell. Stormont Cirrus was the highest-yielding variety at Riddell, its tall-growing characteristic giving it an advantage in height over the other varieties. In normal seasons, however, Stormont Cirrus may grow too tall, and so be liable to lodge. Another disadvantage of this variety is its poor grading for yield of fibre and fibre strength. Late sowing and a short growing period in 1942 favoured the early-maturing varieties at Riddell, and all outyielded the late varieties.

Seed Pickling Trials

Overseas experience has shown that the treatment of seed is necessary for the control of seed-borne diseases of flax such as Seedling Blight (*Colletotrichum lini*) and Browning (*Polyspora lini*), and while Australian crops have been reasonably free from these diseases it is a wise precaution to adopt some method of seed pickling. Field trials were conducted in 1942 to test the efficacy of pickling an ordinary run of Liral Crown seed with mercurial powders.

Germination counts revealed a slight improvement in population on the plots sown with pickled seed, but no definite increases in yield of straw per acre were obtained.

It is to be expected that the need for seed treatment will become more apparent when the crop has been grown for some years.

Rolling and Method of Sowing Trials

Rolling before or after sowing, or rolling after the crop has brairded, is practised by some growers, but the precise conditions under which rolling is desirable and its effect on the flax crop are not really understood.

The effect of rolling will vary with soil and weather conditions at seeding, and it is probable that its greatest advantage will be demonstrated in a season with a dry seeding period. One important practical advantage of rolling is that it enables the binder to leave a much

shorter stubble on land that was in a rough condition when sown, and the extra length of straw thus obtained may make an appreciable difference to the valuation of the crop.

The results of rolling tests conducted in 1942 are inconclusive, and no specific recommendations can be made. The tests will be continued in 1943.

Rotation Trials

Experience has shown that where flax is grown too often on the same land the soil becomes "flax-sick," due to the presence of "Flax Wilt"—a disease caused by the fungus, *Fusarium lini*. Flax, therefore, should be grown in rotation with other crops.

To obtain information as to the most suitable rotation a trial with flax as the main crop was initiated at Strathkellar, in 1941, on a permanent site on the land which had been under pasture for some years. The objective of the experiments is to provide evidence on the following questions:—

The yield of flax sown after different crops.

The effect of flax on the crop following.

The frequency with which flax can be grown on the same paddock.

Whether flax is better as the first or second crop after ploughing.

The effect of sowing pasture with flax as a cover crop. Eleven rotations are being tested, and include—flax sown on the same site every year and every second, third, and fourth year, also flax sown after oats, peas, rape, pasture, and fallow.

The first yields of flax sown after other crops were obtained in 1942, and are shown in Table V.

Table V.—Flax Rotation Trials—Strathkellar, 1942.

	Cwt. per Acre.
Flax after flax	43·6
Flax after oats	39·8
Flax after rape	42·8
Flax after peas	42·8
Flax after pasture	46·5

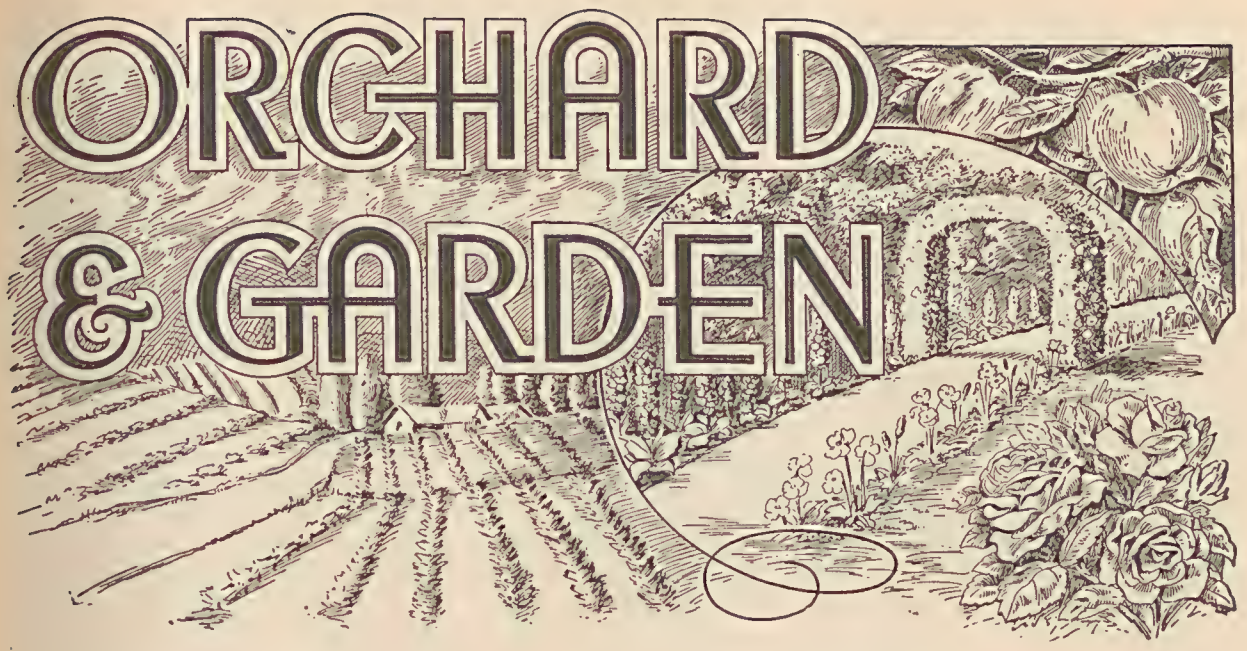
These results demonstrate that a second crop of flax may be taken from the same land in two successive years without loss of yield if that land has not previously grown flax. Flax after pasture gave the highest yield, and this confirms the experience of many growers who have found that their best flax crops are grown on land ploughed from pasture, especially where subterranean clover has been prominent in the pasture. The lower yield of flax after oats may be accounted for by the fact that the oat crop yielded 3 tons per acre in 1941, whereas flax in the same year yielded only 14 cwt. per acre.

The Rutherglen and Myrtleford investigations were conducted by Mr. R. H. Hayman, B.Agr.Sc., Experiment Farm, Rutherglen, who also furnished the reports covering those two centres.

Purification of Water Supplies for Butter Factories—*continued from page 190.*

daily and the particular treatment required. The initial outlay will be affected also according to whether the company decides to erect its own dosing tanks, sand filters, &c., and operate the plant manually, or to purchase automatic plant for the purpose. In either event, plain chlorination is the least expensive treatment to instal and each additional treatment adds to the cost. Overall cost of chlorination alone using liquid chlorine and an automatic chlorinator does not exceed £150 whereas the purchase of a complete plant covering aeration, sedimentation, filtration and chlorination of 8,000 to 10,000 gallons capacity per day of eight hours, may involve an outlay of close on £1,000.

Operating costs may be limited to expenditure on chemicals but will also include the cost of power if pumping should be necessary. As a rule, actual chemical costs for water treatment are comparatively low but will vary from less than one half-penny to as much as five pence per 1,000 gallons of water treated, dependent upon the treatment required. Any power costs will depend upon the head pumped against and the quantity of water pumped but, as in most cases the installation of a treatment plant means only an additional 15 to 20 feet of head, the extra power cost is not very high.



In the Flower Garden

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

PREPARATIONS for winter and spring flowering plants can be continued during April. Early this month, the summer flowering annuals which are past their best should be removed and the beds manured and dug over.

Exceptionally good healthy plants should be allowed to remain until the seed is thoroughly ripened. Some flower seeds may be difficult to obtain in the future, and home gardeners can save their own seed without much effort. Some seed heads, particularly those from which the seed is shed readily, or which, like marigolds, the birds are very fond of, should be covered with a brown paper bag. Invert the bag over the seed head, and gather the open part about the stem, then tie it securely with a piece of string. If the seed head is heavy and likely to droop so that water may run into the folds of the bag, the stem should be supported with a thin stake.

Aphis and Mildew.

Aphis will be making its appearance in the garden now, and early control measures should be adopted. Spray with nicotine sulphate, 1 tablespoonful to 2 gallons of water. Add a small quantity of soft soap, or white oil emulsion, to increase the wetting power of the spray. Roses and chrysanthemums will require particular attention.

The dewy conditions in the evenings and mornings and the mild weather during the day are favourable to the development of mildews on a number of plants. These fungous diseases can be controlled by spraying with colloidal sulphur or dusting the foliage with flowers of sulphur.

Pansies and Violas

The pansy and the viola are excellent subjects for either a low massed effect in a bed by themselves or for a border around a bed. Plants should be set out not later than early this month. Both these subjects require a well-prepared soil in which old cow manure has been thoroughly mixed. Good drainage is essential and this can be partly attained by building up the beds about 8 or 9 inches above the surrounding paths or lawns. Select a sunny position to induce late winter and early spring flowering. When the plants commence to flower, they should be watered with liquid manure. The large exhibition types require very frequent manuring to maintain the size and number of the blooms.

Some good exhibition strains are:—*Engelman's Special, Roggli's Giant Exhibition. Regal Exhibition, Giant Orchid Flowered,* and *Mastoden Super Swiss Giants.* All of these are noted for the very large blooms and the wide range of colours they contain. Plant in rows 15 inches apart and 9 inches between the plants.

Among the smaller flowered bedding pansies which can produce such a bright effect in the garden in spring, there are:—*Celestial Queen,* a lovely azure blue; *Golden Queen,* large golden yellow; *Prince Bismarck,* tawny yellow; *Lord Beaconsfield,* dark blue; *Meteor,* red-brown; *Emperor William,* bright blue; *Candidissima,* white.

For massed effects, a single variety may be selected, with another variety which will tone, or contrast, with it, as a border. Mixed beds do not as a rule look so attractive as a single, or two or three colour effect. Plant these varieties about 9 inches apart each way. This will allow sufficient room between the plants, which should form a solid carpet-like effect when in full bloom. A good plan is to place a few spare plants in another corner of the garden to fill the gaps if they occur in the main bed. Such plants should be lifted with soil, disturbing the root-system as little as possible.

An added advantage with violas is their very long flowering period. Set the plants about 6 inches apart each way. Massed or border effects show off these plants at their best.

Good varieties of violas, which make up in quantity of flowers for what they lack in size of individual blooms are:—*Lutea splendens,* yellow; *Blue Perfection,* blue; *Apricot,* apricot; *Ruby Gem,* bright red; *Papilio Lavender Blue,* a true lavender.

IN THE VEGETABLE GARDEN

Plants of *Eastham* and *Savoy* cabbage and *Late Metropole* cauliflower may be planted out this month. Before digging over the bed prior to planting, apply blood and bone manure at the rate of at least 2 or 3 oz. per square yard. Firm the soil after digging by tramping over it or give it a thorough watering a day or two before planting is to commence. Space the plants 2 ft. 6 in. apart each way.

Thin out sowings made last month of turnip, swede, prickly spinach, silver beet, and red beet. The spacings should be approximately—turnip, 4 inches apart; swede, 6 inches; prickly spinach, 4 inches; silver beet, 4 to 6 inches for a first thinning and then later about 9 to 12 inches, these and the prickly spinach thinnings can be used in the kitchen; red beet, 3 inches.

Lettuce

Seed of *New York, Imperial D,* and *Webb's Wonderful* lettuce may be sown in seed-beds or boxes and transplanted at the end of April or in May. It may also be sown in drills in the permanent garden beds and later thinned out to about 10 to 12 inches apart. Protection from snails and slugs must be given particularly at this time of the year. A tablespoonful of calcium arsenate mixed in a pound of bran and then moistened with a solution of a small quantity of molasses in hot water, until it is crumbly and resembles fowl's pollard and bran mash, will be found very effective if spread thinly around the garden in the late evening.

Broad bean seed may be sown now, and the instructions given in these notes last month should be followed. Good varieties are *Cole's Dwarf Prolific* and *Leviathan Long Pod.*

An early sowing of either *English Wonder* or *William Massey* peas should be made this month. These sowings become well established before the very cold weather arrives. Plant in well-raised beds, because good surface drainage is essential for the growth of peas. An ounce of superphosphate and 1 ounce of blood manure per square yard will assist growth. If the previous crop was well fertilized with blood or some other nitrogenous fertilizer, only the application of superphosphate will be required.

Onions

Seedlings of *Silverskin* and *Early Barletta* onions can be transplanted to their permanent beds now. Preferably plant these in a bed after a heavily-manured crop has been taken off. Dig the bed deeply, and apply 4 to 6 ounces of agricultural lime per square yard. Leave the lime on the surface, mixing it with the surface soil with a light brushing with a fork. Do not break the surface soil down too finely at this time of the year. Top and tail the young onion seedlings before planting. This means that about the top third of the leaves and all but about ½ to ¾ inches of the roots are removed. Do not plant the young seedlings too deeply—remember that onions are surface feeders.

Seed of *Early Brown Globe* and *Odourless* onions can now be sown in seed-beds or boxes. Firm the seed in the seed-bed by patting with the back of the spade and cover with about ½ inch of fine soil.

IN THE ORCHARD

Contributed by the Horticultural Division

Autumn Cultivation

ALTHOUGH the early planting of seed for green manure crops is advised, fruitgrowers may find that the labour shortage has compelled them to wait until the bulk of their crop had been harvested before starting the autumn cultivation.

In northern districts there is usually sufficient warm weather left to justify planting before the middle of this month. Where it is not intended to plant a green crop, ploughing in the autumn is not necessary except for a furrow in the centre of each row to take away surface water during wet weather. Ploughing and allowing the soil to remain bare during the winter is not advisable, especially on hill country, because soil unprotected by plant growth may be severely washed and eroded during periods of much rain.

Preparation of land for sowing a green crop in the autumn.

In addition to this factor, the weed growth which occurs following the autumn rains, even though it may not contain beneficial leguminous plants, is useful in that nitrates are taken up by the growth instead of being leached out of the soil by winter rains. This nitrogen accumulated in the plants is then released into the soil when the land is ploughed in the spring.

Harvesting Oranges

Some Navel oranges usually appear on the market during April, and although the fixed price and light crop may act as a deterrent to early harvesting, it is necessary to again warn growers against the marketing of unripe fruit. The use of ethylene to hasten the development of the orange colour in the skin of early picked fruit is quite legitimate, provided that the "gassing" is effective and that the fruit will pass the maturity test. It might be advisable to try a few oranges first to see if full colour will develop under gas treatment, otherwise the fruit may be pale and anaemic in appearance.

It has been found that a concentration of 1 cubic foot of ethylene to 10,000 cubic feet of chamber space is sufficient to effectively colour the fruit. The humidity of the chamber should be maintained by the use of tins of water in the chamber, and during cold weather electric radiators may be required to maintain the temperature at 60 deg. Fahr.

In order that Navel oranges should pass the maturity test it is necessary that 10 cubic centimetres of the juice expressed from five oranges taken at random from the consignment should not require more than 24 cubic centimetres N/10 soda solution to neutralize the acidity of the juice.

Selection of Grafting Wood

Apple and pear growers who intend to rework trees next spring should keep an eye on likely trees for the provision of scion wood. The chlorotic mottling of apple leaves is transmitted by grafting, and it would be wise to mark limbs of trees free from this virus disease which would be suitable as a supply for scions. Some branches of Jonathan apple trees produce fruit of superior colour, from which scions should be selected. In choosing suitable pear scion wood, trees showing any infection from the pear leaf blister mite should be avoided.

Harvesting Walnuts

The bulk of the walnut crop should be ready for harvesting this month. Prior to the picking period, if it is not possible to spread tarpaulins of hessian or canvas around the trees, the soil should be harrowed as smooth as possible to

permit the easy collection of fallen nuts. The nuts should be collected as frequently as possible, because if they are allowed to remain on the ground they quickly become stained. Dusty or muddy nuts should be washed before being spread out on trays to dry. A satisfactory bleaching solution for the treatment of stained nuts may be made by dissolving 25 lb. of chloride of lime together with 18 lb. of washing soda in 50 gallons of water. After mixing this solution it should be allowed to settle and the clear liquid run off into another container. To the clear solution is added slowly 1 lb. of sulphuric acid. Stained nuts dipped in this solution should then be put out immediately for drying.

Drying Ohanez Grapes

In recent years some vine growers have adopted the practice of drying part of their crop of Ohanez grapes. With the closing of overseas markets for this fruit, it may be that the local market will be oversupplied with this variety.

If the fruit is to be dried, it should be treated as soon as the fruit reaches maturity, because suitable drying weather at this time of the year is rather indefinite and it may be necessary to resort to the use of the dehydrator. Because of the thickness of the skin on the Ohanez variety, some growers may anticipate difficulties in drying the fruit. Experience has shown that the dip, held at a temperature of 200-212°F., is sufficient to crack the skins. Care should be taken to avoid overcracking, which would result in the development of moulds and loss of sugar.

Strawberry Planting

Some strawberry growers may intend to plant new ground during the autumn. In the selection of runners, every care should be taken to avoid plants showing signs of virus infection. The symptoms of the "crinkle" disease appear most obvious during this month. Plants with leaves showing a crinkled appearance with mottled, yellowish edges, should be removed and destroyed, while runners should be selected only from plants with vigorous healthy green leaves.

FLAX PROBLEMS

During the past two flaxgrowing seasons a number of flaxgrowers whose crops have been subjected to overwet conditions have suffered a crop loss due to a disease which has become known as "Dieback". The tops of affected plants wither and the length of the straw is greatly reduced.

For some time the Department of Agriculture has been investigating this particular problem, and there is some evidence to suggest that the trouble may be overcome by an early application of lime at the rate of 2 tons per acre or more. To be most effective, it is considered that the lime should be applied at least two months before the crop is planted.

It is impossible for the Department to accurately forecast the season and the areas where this trouble may occur, so that it is quite likely for a number of experiments to be carried out in areas wherein conditions may not be such as to promote "Dieback" in the season concerned.

The Department's efforts to overcome the disease would be greatly assisted if, on their own initiative, as many flax growers as possible would broadcast a narrow strip of lime at the rate of 2 tons per acre across the land they will subsequently plant with flax, and report to the Agricultural Superintendent, Department of Agriculture, Public Offices, Melbourne, any obvious results as far as crop growth is concerned. By so doing, they would be helping the Department to help the Flax Industry.

Maize Diseases In Victoria

By C. R. MILLIKAN, M.Agr.Sc. *
and W. V. LUDBROOK, B.Sc.Agr., M.S., Ph.D. †

DURING the past twenty years, there have been several seasons in which losses caused by root, stalk, and ear rots in Victorian maize crops have been particularly severe. One such outbreak occurred in the 1934–35 season when it was estimated that the maize yield in the Orbost district was reduced by 150,000 bushels through this cause.

As a direct result of this loss, an investigation of this group of diseases was begun in 1936 by the Department of Agriculture, Victoria, and was continued until 1942, with the co-operation of the Council for Scientific and Industrial Research since 1940. It is probable that owing to war conditions most of this work will have to be suspended indefinitely. Although finality has not been reached on most of the subjects to be discussed, the following summary has been compiled to indicate the main lines of work and the chief results hitherto obtained.

Fig. 1. Ear rot of maize caused by *Diplodia zeae*.

I. Relative Importance of Different Types of Diseases and their Relation to Climate

Ear rot appears to be the chief source of loss under Victorian conditions; *Diplodia zeae*, which was first recorded at Lindenow in 1922, is probably the most important cause of this loss, though *Gibberella fujikuroi* var. *subglutinans* may at times be more common.

The severity of ear rot depends largely on climatic conditions at and after tasselling. Excessive humidity during the milk and dough stages of the grain is generally thought to be the main factor favoring infection. In Victoria, however, *Diplodia* ear rot is commoner in the Lindenow district than in other districts where the mean rainfall and humidity are higher, or where irrigation is practised.

In an effort to explain this anomaly, records of Lindenow rainfall and crop data from 1923 onwards were studied. Ear rot was most severe in the 1927–28, 1934–35, and 1937–38 seasons. The common features in each of these seasons, which were conducive to ear rot, were the occurrence of dry weather during December, January, or February, causing a severe check to growth, followed by heavy rain and muggy weather in March or April. By comparison it appeared that ear rot was not serious in those seasons in which good rains occurred throughout the growing period, or when dry weather was experienced both before and after tasselling.

To obtain further information on the subject, an irrigation experiment was conducted at Lindenow in 1941–42. It was found that in plots subjected to a dry spell at tasselling and irrigated three weeks later the maize developed a significantly higher percentage of ear rot than in those irrigated just before tasselling.

Further evidence of the importance of the moisture relations of the plant in determining the amount of ear rot was obtained in field observations during 1941. These observations showed that there was a higher percentage of ear rot in the drier fields of the district, and on the drier patches within a given field, than in the moister areas.

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Fig. 2. Root and basal stalk rot of maize.

The explanation of these facts is not yet known, but they suggest that a check to growth through lack of moisture at tasselling may predispose maize to ear rot infection, given suitable atmospheric conditions later on. It is well known that plants are more sensitive to lack of moisture at flowering time than at any time during their life (1, 2, 4). A drought at flowering cannot be compensated for by abundant rainfall later. This was demonstrated in the very dry 1938–39 season at Boisdale, where irrigation is practised. In that season, the crops irrigated before tasselling were good; those irrigated later were poor.

Root and Basal Stalk Rot.

The earliest symptom of this condition is that the foliage of the whole plant changes from deep green to pale or greyish-green; the leaves lose turgidity and dry out evenly, becoming almost white when dry, although later more or less discoloured by weathering and saprophytic fungi. The base of the stem may appear water-soaked and more or less discoloured when split open; the affected tissue may be greyish, yellowish, or brownish, or may show very little discoloration. It usually has a mouldy or fermenting odor. The stalks of affected plants dry out sooner than those of other plants, the pith loses its turgidity, becoming dry, spongy, and pale yellow, and the stalk is supported only by a thin cylinder of lignified cortical tissue, which often collapses and kinks, allowing the upper part of the plant to fall to the ground. The pith disintegrates from the base of the stem upwards, leaving only the vascular bundles, often over-run with pink, white or grey fungal mycelium in the lower internodes (Fig. 2). Except at the very base of the stem, the pith appears to die and partially dry out before it is invaded by fungi. The nodes do not check the spread of the above symptoms up the stem. This serves to distinguish the condition from that termed *localized stalk rot*, which occurs in the upper parts of the stem, usually originating from the nodes via decaying rudimentary ears, cracks in the rind caused by unequal growth, wind or tillage injuries, or by artificial inoculation. (Fig. 3.) Localized stalk rot is not considered important in Victoria.

Root and basal stalk rot is also thought to be largely dependent on climatic conditions. Although ear rot fungi are concerned in the actual rotting of the stalks, there is evidence that, at least under Victorian conditions, their attack usually follows natural senescence or premature physiological breakdown of the stalks. The latter may be induced by a sudden deficiency of moisture at tasselling. It has been seen to occur on a large scale in Victorian maize fields, and to be followed by extensive fungal rotting of the roots and stem bases and shrivelling or complete absence of ears, under the following conditions:—

(*a*) In the first maize crop after a three years' pasture (perennial rye grass and red clover) in a rotation experiment at Orbost. This crop made a much more vigorous vegetative growth (probably caused by a high nitrogen status of the soil) up to tasselling than the "maize continuously" treatment (Fig. 4), followed by a severe set-back during a dry spell at tasselling. The "maize continuously"

Fig. 3. Localized stalk rot caused by inoculation with *Gibberella* and *Diplodia*.

plots did not suffer this set-back. Maize crops following pasture are unusually healthy if the soil moisture is adequate (Fig. 5). This crop failure after pasture is similar to that reported by Kiesselbach *et al.* (3). They state: "Nebraska farmers have had considerable difficulty with corn 'burning' following a legume crop. The reason for this is that the nitrate content has been built up to a point where it is too high in comparison with available moisture. Since sorghum is relatively drought resistant and tends to 'tie-up' available nitrates, it offers one of the best possibilities as a crop to follow alfalfa or sweet clover."

(*b*) In crops growing on a layer of rich alluvial surface soil overlying an open sandy sub-soil, as is common on river frontages (Fig. 6). If the top soil contains sufficient moisture to support vigorous growth up to tasselling, and a dry spell supervenes, the plants may collapse through lack of reserve moisture in the sub-soil and may be subsequently invaded by root and stalk rotting fungi.

Fig. 5. Left of spade; three typical maize plants grown on old maize land. Right; three plants from the second maize crop after pasture.

Strong evidence in support of this belief was obtained from field observations in the season immediately following two of the abovementioned cases. In these instances the areas were again sown to maize, and produced excellent crops with insignificant amounts of root and basal stalk rot, in spite of the large amount of inoculum (infected roots and stalks from the previous crop) which must have remained in the soil. This is attributed to the fact that there was sufficient rainfall in this season to maintain an ample supply of moisture in the subsoil.

Apart from special instances such as these, pre-harvest root and basal stalk rot has, in the writers' experience, been largely confined to plants which have ripened somewhat earlier than the average for the crop, but have usually formed an ear of average size and weight.

Fig. 4. Portion of rotation experiment at Orbost, a few weeks before tasselling. Left: "Maize continuously." Right: "Maize after pasture."

Seedling blight appears to be of minor importance in Victoria, but if cold, wet conditions follow planting, a considerable reduction in stand may occur. Treatments with fungicidal dusts gave negative results during two seasons, but, at Orbost in 1941, treatment of commercial seed with Agrosan gave a 38 per cent. improvement in germination and a yield of 80.4 bushels per acre, as compared with 66.8 bushels per acre from untreated seed. Both differences were highly significant.

Fig. 6. Collapse of stalks during a dry season on river frontage land with a sandy subsoil, at Boisdale.

II. Disease Resistance

When feasible, the selection or breeding of resistant varieties offers the greatest possibility of economically preventing loss from disease. Amongst local varieties, Hickory King (with horny endosperm) developed less ear rot during two seasons than white or yellow varieties with starchy endosperm, but the difference was slight, and no local variety has been found to exhibit any important degree of resistance. As maize is open-pollinated, breeding for disease resistance would involve a long and costly programme of inbreeding and hybridizing, with a certainty of improving the yield and a possibility of increasing disease resistance. Such a programme was formulated, but was rejected on the grounds of expense and war conditions.

Attempts were then made to discover whether disease-resistant material could be obtained from overseas. A South African hybrid consistently displayed greater resistance than local varieties to ear rot during two seasons' trials, but was inferior in yield and was by no means immune from rot. Several American inbreds, claimed to be resistant to ear or stalk rots, failed to show resistance when tested by artificial inoculation, but the writers do not consider that such results are necessarily indicative of reaction to natural infection with either type of rot.

Wound inoculation of the stalks with pathogenic fungi may be a satisfactory way of testing for resistance to localized stalk rot, but the writers have no evidence that it gives any indication of resistance to root and basal stalk rot. Hitherto, it has not been possible to produce the latter condition at will.

III. Agronomic Practices in Relation to Yield and Occurrence of Disease

In the absence of resistant varieties, crop sanitation and the improvement of growing conditions may offer a means of disease control. The avoidance of continuous cropping is the most obvious control measure of this type, but for economic reasons this is a counsel of perfection under Victorian conditions, where much of the very limited area of land suitable for maize growing is so rich and of such high value that no alternative method of land utilization, economically practicable on a large scale, will give equal returns.

After grazing by cattle, the remaining stubble is burnt, as far as possible, by most farmers; its complete removal by hoeing out the stem-bases, as is sometimes suggested, would, in the long run, cost far more than the losses due to disease. Moreover, where large areas of maize are grown on numerous adjacent farms, as on the Gippsland river flats, these measures are of little avail against wind-blown infective material, unless uniformly adopted throughout the whole district.

Annual disease surveys have included several continuously cropped fields in which the whole of the stubble left after grazing is regularly ploughed in. There is a marked tendency for head smut (*Sorosporium reilianum*) to increase in such fields, but the writers have been unable to find satisfactory evidence for their greater susceptibility to root, stalk and ear rot.

The alluvial soils at Orbost contain such large amounts of mineral nutrients, periodically replenished with silt deposited by floods, that, although over-cropping gradually leads to an obvious loss of vigour and decline in yield of maize, no consistent response is obtainable with inorganic fertilizers or minor elements. On the lighter frontage soils, it has often been observed that applications of superphosphate may result in an increase in growth up to the tasselling stage, in spite of which no significant difference in final yield results.

It is widely recognized that rotation with legumes, or above all a period under lucerne or pasture, is highly beneficial to land over-cropped with maize, although, as mentioned above, the

first maize crop following lucerne or pasture is likely to suffer from a dry spell at tasselling. The beneficial effect on the yield of maize of a crop of peas in the previous season was shown in an experiment in the 1937–38 season. "Maize continuously" yielded 46 bushels per acre, whereas the yield of "maize after peas" was 58 bushels per acre. This difference was significant.

Since rotation is often claimed by growers to be economically impracticable, efforts have been made to find an alternative means of conserving fertility, such as green manuring with winter legumes between successive crops of maize.

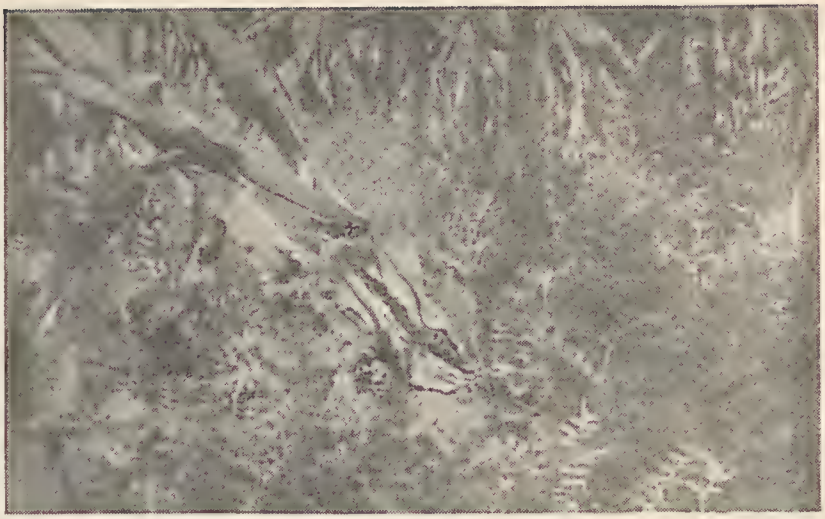

Fig. 7. Cover crop of golden tares and crimson clover, sown under standing maize at tasselling on a sandy river frontage at Orbost.

Most Victorian maize is not ripe enough to pick before late autumn or winter, and there is insufficient time to grow a green manure crop between successive maize crops. Such a crop would either have to be sown under the maize before the last inter-cultivation at tasselling, or follow an alternative crop such as beans or peas, which could be harvested early enough to permit the growing of a green manure crop before preparing the ground for maize the following spring. Both these alternatives have been tried.

At Orbost, in 1941, Dun field peas, golden tares, and Mulga oats were sown at the end of March, on land from which wax-beans had been harvested for seed. Each yielded a heavy growth of green-stuff, which was ploughed under in July or August. Maize sown in October averaged 105 bushels per acre after peas, 103 bushels after tares, 83 bushels after oats, and 94 bushels after no green manure (difference for significance = 8 bushels per acre). This will be referred to as experiment "A". The adverse effect of the cereal (oats) was confirmed in another experiment "B" on poorer soil, where green manuring with barley reduced the yield of the following maize crop.

The other alternative, of establishing a leguminous cover crop under standing maize at tasselling, was effective in experiment "B" on a sandy river frontage soil probably low in nitrogen. Tests for nitrate (5) on plants growing on this area revealed a marked deficiency. Here a mixture of golden tares and crimson clover sown in January under the 1940–41 maize crop made good growth (Fig. 7), and the following maize crop yielded 57 bushels per acre as compared with 38 bushels per acre from "maize after maize" without inter-sown legumes (difference for significance 10 bushels per acre).

It is not claimed that tares and crimson clover are the best legumes for this purpose; the germination of the latter was unreliable. Tick beans have shown some promise. On a richer soil legumes made little headway under maize, owing to excessive shading, and were choked by autumn weeds.

There was no significant difference in the distribution of ear rot between the treatments in any of the above experiments, and in "A," "maize after legumes" contained 14.3 per cent. of basally rotted stalks at harvest, as compared with 7.5 per cent. after oats, and 8.1 per cent. after no green manure, the difference between the first and the latter two figures being highly significant. The prospects for disease control by green manuring with legumes, therefore, are not encouraging.

In experiment "A" the application of 2,500 lb. of burnt lime per acre produced a significant increase in yield of about 10 bushels per acre, the control plots averaging 88 bushels per acre, but there was no response to 1,500 lb. of burnt lime or to 2 cwt. of superphosphate alone or with either dressing of lime. There was no interaction between green manures and superphosphate; the additional increase due to 2,500 lb. of lime was greatest after oats, and was not significant after peas.

There is observational evidence to show that considerable injury to the texture of the surface soil may be caused by the trampling of cattle

Fig. 8. "Multiple Nubbin" ear.

which graze on the maize stubble during the winter. The site of experiment "A" was enclosed by a temporary fence during the growth of the green manure crops, and the rest of the field was sown with oats. These were grazed by cattle in spring, after which the land was ploughed, the temporary fence removed, and the whole sown to maize. The experimental area, from which cattle were excluded, made much better growth than the rest of the field.

Eight sample plots from the latter, close to the experimental area, averaged 62 bushels per acre, while control plots in the experiment averaged 94 bushels per acre, and "maize after oats" 83 bushels per acre. It is extremely unlikely that this difference was due to natural soil variation. Although, in the absence of replication, its significance must remain uncertain, the only reasonable explanation available appears to be the extra cultivation, longer fallow, and protection of the experimental area from trampling by cattle. However, the economic advantage of stubble grazing makes it questionable whether the avoidance of this practice would be profitable under all conditions.

IV. Hybrids and Improved Varieties as a Means of Increasing Yield

It was noticed that many Victorian crops contained fairly high percentages of barren plants, and consideration was given to means of reducing these percentages, either by the improvement of local varieties or by the introduction of improved varieties or hybrids from elsewhere. It was found, however, that environmental conditions played a much greater part than heredity in determining the percentage of barren plants in local open-pollinated varieties, although the percentage in all hybrids tested was much below that of the best open-pollinated varieties. Under Victorian conditions, the average for commercial crops was about 10·5 per cent. of barren plants, and for hybrids about 1·7 per cent.

Owing to the risk of disease introduction, American hybrids have not been tested in Victoria. Most of a number of hybrids and top crosses from the Queensland Agricultural College tried at Orbost were too late for Victorian conditions, and with very few exceptions the remainder appeared unlikely to out-yield the best local varieties. It is improbable that hybrids adapted to such widely different conditions as those of Queensland would be successful in Victoria, though a few of those tested may be worthy of further trial.

"Multiple Nubbin" (Fig. 8) ears were at first suspected to be a sign of inferior seed strains, but it soon became apparent that any factor interfering with the normal setting of grain was likely to induce this abnormality. The proportion of "multiple nubbins" was experimentally increased by removing the ears from normal plants at silking, or by preventing the setting of grain by withholding water at tasselling, the plants being subsequently watered freely.

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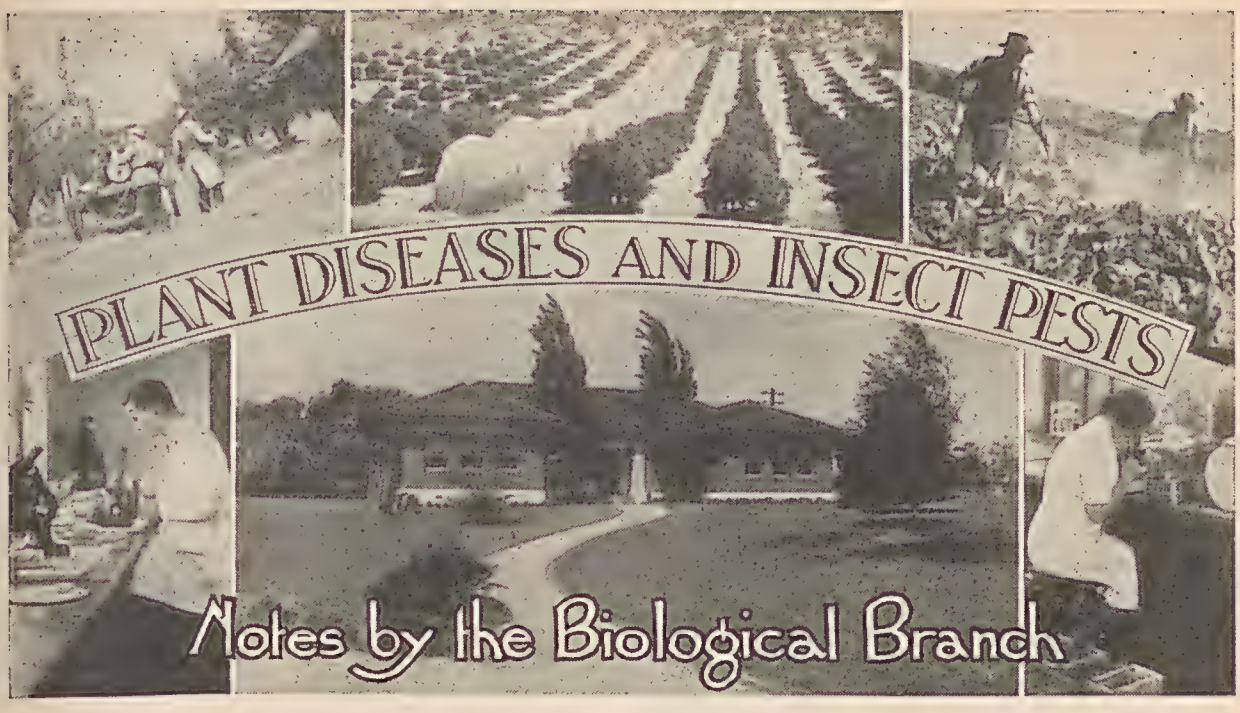
— HELP OTHERS TO HELP YOU—CO-OPERATE —



FUSARIUM ROOT ROT OF ONIONS

Root Rot of onions, which is caused by the fungus *Fusarium oxysporum*, has been responsible for considerable losses in the Colac district, and has also caused trouble in the metropolitan area. Apart from the actual loss of produce, which may amount to from 1 to 3 tons per acre, the disease makes hand sorting of the crop essential, thus greatly adding to the cost of production.

In the field, the disease may cause premature yellowing of the tops of the plants, because of the destruction of the roots. Such plants only rest lightly on the soil, and may be pulled up readily. When an infected crop is dug, a superficial examination may not reveal the extent of damage, as the fungus attacks from the base of the bulb, and the covering scales remain normal in appearance. If the bulbs are examined more carefully, however, a soft rot of the basal plate and the lower portions of the bulb scales can be detected, and in many cases whitish fungal threads (the mycelium of the fungus) are also visible. In storage the rot will extend upwards finally destroying all the contents, leaving only the dry shell.

Control

To check the disease, a proper system of crop rotation is essential. This measure must be accompanied by field sanitation; all diseased material being removed from the field and properly disposed of—*not* spread over the fields or fed to stock.

The disease is aggravated by wet weather and, therefore, the crop should be gathered as soon as possible after harvest.

If the disease is detected in the crop, the produce must be carefully sorted before storing.

The onion stacks must be built in such a way as to provide the maximum amount of ventilation.

Rot of the scales which commences at the root end.

Marrow leaf affected with powdery mildew.

POWDERY MILDEWS

At this time of the year most gardeners will notice a whitish meal on the leaves of a large variety of plants, including pumpkins, marrows and other cucurbits, vines, and roses. The trouble is due to a fungal organism which grows on the surface cells of the leaves. The fungus produces large numbers of spores, "seeds" of the fungus, which give the white appearance to the leaves. In many cases this white meal development is accompanied by considerable distortion of the leaves and may be found on other parts of the plants such as the stems, flowering buds, and the fruit.

Control

Fungi of this type are favoured by humid conditions, therefore, if possible, an open sunny position should be selected for plants subject to this trouble.

As previously explained, the fungus growth is superficial and so, unlike most plant diseases due to fungi, the parasite is accessible to fungicides even after infection is established. Sulphur is the best fungicide to use, and finely-divided sulphur should be dusted on to the leaves of the plants as soon as infection is apparent. The dust will be less likely to cause injury to the leaves if it is applied in the early morning, and it will adhere to the leaves better if 1 part in 10 of lead arsenate dust is incorporated with the sulphur, and it is applied when the leaves are moist with dew.

The fungus overwinters on infected stems and in infected leaf debris. Therefore, prunings from infected plants should be destroyed by burning, and fallen leaves should be disposed of in the same way.

With many plants, including the cucurbits, the disease does not usually attack the plants until they are past maturity. Of course, no useful purpose is served in treating these plants if the fruits are already mature. If, however, the attack occurs before the crop is mature, control measures should be used.

WALNUT BLIGHT

Walnut Blight, caused by the bacterial organism, *Bacterium juglandis,* is the predominant disease of the walnut in Victoria, and many inquiries regarding the disease have been received this season.

The most noticeable effect of the organism is on the fruit. If it is attacked at an early stage of development, the kernel usually rots, or the fruit may drop before maturity. Infection at a later stage of development causes black sunken areas on the fruit. These areas slowly increase in size and may finally cover practically all the fruit surface.

The bacteria also cause small black spots of dead tissue on the leaves. If this type of attack is severe the general health of the tree is affected.

Powdery mildew on rose leaves.

Blight on walnut fruits.

Control

Unfortunately, the disease is very difficult to control. The infected fallen fruit and leaves should be destroyed by burning, which tends to reduce the "carry-over" of the disease.

American workers recommend spraying with 4:4:80 Bordeaux mixture just before the bulk of the female or nut-bearing flowers open, just after fruit setting when the nuts are about the size of peas, and again ten days after the second application.

To prepare 5 gallons of 4:4:80 Bordeaux mixture, dissolve 4 oz. of copper sulphate (the fine crystalline form known as "Neige" crystals dissolves more readily) in 2½ gallons of water in a non-metallic vessel. Mix 4 oz. of hydrated lime with 2½ gallons of water in another vessel. Then mix the two solutions by pouring them simultaneously into a third non-metallic vessel.

APHIDS

At the present period of the year, aphids, frequently spoken of as "blight" or "green flies," are a constant source of worry to both flower and vegetable gardeners.

In the flower garden, the rose aphis and the chrysanthemum aphis are abundant now, while in the vegetable garden aphids are causing serious damage to such plants as cabbages, carrots, and celery. The damage caused by these insects is primarily the result of the sucking activities of the aphids, resulting in considerable loss of sap, with the resultant wilting of the plants. Particularly in dry weather is this loss of sap important, as death of the plants may result under these circumstances.

While, under certain circumstances, these pests are kept in check by natural parasites, such as ladybirds, lacewings, and hoverflies, it is not wise to rely on these parasites for control, but to apply recognized measures as soon as the pests appear on the plant.

For the control of the aphids themselves on the plants, a nicotine mixture, either in the form of a spray or a dust, must be used.

If spraying is the more convenient, the mixture should be as follows:—

Nicotine sulphate	1 fluid oz. (2 tablespoons)
Soap	.. 2 oz.
Water	.. 4 gallons.

This should be applied directly on to the aphids on the plants. Choose a warmish day to do the spraying, and adjust the spray nozzle if possible so that a drenching spray is applied. It may be necessary to repeat applications of this spray, as fresh infestations can occur from outside sources.

Where dusting methods are used, the dust should be a 3 per cent. nicotine dust, already prepared for use. This dust is best applied on a warm, still day.

Severe wilting of plants due to cabbage aphis.

THE GREENHOUSE THRIPS

During the autumn months, the Greenhouse Thrips, *Heliothrips haemorrhoidalis* Bouche, causes severe damage to a large number of plants cultivated in the flower garden. The plants chiefly attacked are rhododendrons, azaleas, ferns, laurustinus, lily-of-the-valley tree, and Irish strawberry.

This species of thrips feeds entirely on the leaves of the plant, the greater majority being found on the under surface. Here they cluster in more or less concentrated colonies sucking the sap. They soon produce a typical silvery or bleached appearance on the upper surface of the leaf, while on the under surface there is an abundant production of shiny, brownish dots of excreta, typical of thrips feeding. If the infestation is extensive and serious, defoliation of the plant may occur, with either weakening or death resulting.

The adult thrips is blackish-brown in colour, about 1/25th of an inch in length, and is to be found almost exclusively on the lower surface of the leaf. Eggs, numbering some 25 in all, are laid just under the leaf surface, and these hatch in some three weeks to young, creamish thrips which immediately feed, clustered together, on the sap, until they are fully grown. There are several generations of these insects in a season.

Control

Satisfactory control of this pest is obtained if the plants are sprayed with a nicotine sulphate—white oil mixture as soon as the first signs of thrips are noticed on the under sides of the leaves, or as soon as the first signs of silvering are apparent on the upper surface. This mixture is made up as follows:—

Nicotine sulphate ..	1 fluid oz.
White oil	1 pint
Water	5 gallons.

It is essential when spraying against this insect to use a drenching spray, and to spray upwards into the plant, so that the undersurfaces of the leaves are thoroughly wetted.

It would be advisable to repeat this spray some three weeks after the first application.

SILVERFISH

Silverfish, or fish moths as they are occasionally called, are very common pests in houses, both in the city and the country; in fact, they are usually found in smaller or greater numbers in every household. They are especially prevalent in damp houses, and their presence in large numbers frequently indicates that the ventilation below the floor is not as good as it might be. In addition, they are found in libraries, bakehouses, and other dwellings, in warm, moist, secluded situations.

Injury occurs to the various materials attacked by the scraping and sawing action of the insect's jaws, which removes the surface of papers, or gnaws through the strands of fabrics, until a piece can be removed leaving a characteristic "silverfish" hole.

The most noticeable damage is done to artificial silk and fine writing papers. Cotton goods, particularly if starched, may suffer considerable injury, and the surface is frequently eaten off photographs, glazed papers, and board and book covers. The insects are apparently attracted to these articles by the gelatine and surface dressings on the papers which frequently contain starchy materials. The attack on wool and real silk is not sufficient to damage the fabric unless it has been soiled. In eating off this foreign matter, the silverfish may remove sufficient of the fibre to weaken the material.

Extensive damage occurs also to wall papers, and frequently this is confined to parts of the paper near crevices in which the insects hide.

Silverfish (enlarged.)

The common house silverfish present in Victoria *Ctenolepisma longicaudata* Esch. measures about three-quarters of an inch when fully mature, is creamy in colour, and is most active at night time, when it is to be seen crawling on the walls and floors, particularly along the edges of skirting boards, door and window frames, and picture rails. During the day time, they hide between the wood and the wall, behind pictures, boxes, and books and any other sheltered place.

Generally they live solitary lives, though numbers may congregate in undisturbed corners. Their solitary feeding, nocturnal habits, and creamish colour allow them to escape notice.

Control

As silverfish attack a great variety of materials in many different ways, control measures usually must consist of a combination of several distinct practices. The chief of these are:—

(*a*) *Use of Pyrethrum Fly Sprays.*—Provided a building is not heavily infested, quite successful control can be obtained by thoroughly spraying the rooms with one of the commercial fly sprays under pressure, for preference using a machine similar to a paint-spraying machine. For a normal house, however, quite successful results will be obtained from the ordinary so-called "fly spray." The spraying should be carried out in the evening when the silverfish are most active, and must be continued until there is a fine mist of spray in the room. This should be repeated in ten to fourteen days' time. Spraying should be chiefly directed at the places where silverfish can hide.

(*b*) *Use of Bait Cards.*—This method is capable of satisfactory cleaning up of a light infestation in a house. Swan, in South Australia, recommends the preparation of the cards from the following materials:—

Flour	4 oz.
Sugar	4 oz.
Salt	$\frac{1}{8}$ oz.
Sodium fluosilicate ..	1 oz.
Gelatine	$\frac{1}{2}$ oz.
Water	3 pints.

The flour should be made into a smooth paste with part of the water (cold). The rest of the water is then added, and the mixture heated to form a paste, stirring the while. The other ingredients are then added. The sodium fluosilicate should be finely powdered to assist its solution.

This mixture should be spread, while hot, on pieces of cardboard, 3 x 2 in., and allowed to dry. From ten to twenty of these cards are set out in each infested room in places where silverfish are abundant. They should be left undisturbed as long as possible.

(*c*) *Treatment of Books.*—A thin coating of tricresylphosphate, made up by dissolving 1 to 2 per cent. of this material in pure kerosene, will protect the surface of books from silverfish damage.

(*d*) *Goods Stored in Cupboards, Drawers, &c.*—Materials which are to be stored for any length of time in cupboards or drawers can be satisfactorily protected by the use of either napthtalene or paradichlorbenzene. Either of these materials should be loosely sprinkled on the bottom of the cupboard or drawer, then covered with paper before the garments are stored.

LIVE STOCK NOTES—*continued from page 182.*

up, a solid scab-like plug obstructs the orifice, and despite treatment, usually extends into the udder tissue, rendering the majority of affected animals useless for dairying purposes.

Where cases of Black Spot occur on a property each year, it is suggested, as a preventative that the teats be immersed daily for the fortnight prior to calving in a solution of sodium hypochlorite—1 ounce in 4 gallons of water.

If ulcers appear, wash the teats with a warm antiseptic solution, gently remove the scabs, dry the part thoroughly, and dress ulcers with an ointment containing 1 part of copper sulphate (bluestone) finely powdered and thoroughly mixed into 9 parts of vaseline.

Milk from affected animals should on no account be used for human consumption.

[W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East ..	177
Ballarat Orphanage ..	Ballarat	111	Northcote Children's Farm	Bacchus Marsh ..	156
Banyule Stud Pty. Ltd.	Wangaratta ..	42	Onley, W. H. ..	"Glenholme," Caldermeade	50
Black, I. S., Estate ..	Mount Noorat ..	52	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Clarke, A. B. ..	Glenormiston South	16	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dennis, Mrs. A. A. ..	Frankston ..	33	Poole, M. A. and D.	Caldermeade ..	134
Dookie Agricultural College	Dookie	77	Poole, M. A. and D.	Yannathan ..	72
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Powell, T. S. ..	"Carellen," Mansfield	46
Geelong Grammar School	Corio	56	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	29	Samuel, Misses G. and E.	Lang Lang ..	48
Gorman, A. W. ..	"Cathcart," Alexandra	61	School of Horticulture	Burnley	10
Hollaway, R. W. ..	Caldermeade ..	72	State Experiment Farm	Rutherglen ..	40
Kilmany Park Farm Home for Boys	Sale	94	State Research Farm	Werribee	229
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	Vagg, T. E.	Officedale ..	45
Longerenong Agricultural College	Dooen	43	Wells, W. G. ..	Caldermeade ..	63

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Anderson, J. B. ..	Warrnambool ..	19	Carr, W. J. ..	Wollert	65
Andison, J. A. ..	Thomastown ..	43	Child, G. P. ..	Epping	53
Andrew, J. C. ..	Whittlesea ..	121	Christian Bros. ..	Doreen	41
Andrew, W. ..	Whittlesea ..	160	Clark, P. W. ..	Whittlesea ..	62
Andrews, E. H. ..	Templestowe ..	19	Cobain, J.	Thomastown ..	48
Balharrie, J. A. ..	Whittlesea North ..	59	Collins, L.	Doreen	48
Barclay, A. H. ..	Whittlesea ..	107	Cornfoot, D. H. ..	Whittlesea ..	25
Barling, J. ..	Mernda	33	Cotchin, J. ..	Woodstock ..	18
Batten, R. J. ..	Wollert	44	Coulthard, J. J. ..	Whittlesea ..	66
Bebbington, J. ..	Whittlesea ..	92	Craker, Mrs. E. ..	Warrandyte ..	2
Benson, R. ..	South Morang ..	35	Cumming, H. R. ..	South Morang ..	23
Bodycoat, A. ..	Wollert	39	Cunningham, E. C. ..	Templestowe ..	23
Booth, Mrs. A. ..	Warrandyte ..	8	Danaher, J. V. ..	Whittlesea ..	63
Bourke, G. J. ..	Fairfield	82	Danns, N. C. ..	Whittlesea ..	34
Bradbury, A. K. ..	Diamond Creek ..	50	Deutscher, H. W. ..	Mernda	168
Bunting, J. ..	Epping	35	Deveny, M. ..	Bundoora ..	51
Butler, W. ..	Wallan	49	Draper, L. S. ..	Wollert	31
Callaghan, L. ..	Epping	34	Drysdale, J. C. ..	Warrandyte ..	41
Callaghan, T. F. ..	Thomastown ..	40	Fellows Bros. ..	West Heidelberg ..	52

Name.	Address.	Number in Herd at Last Test.
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Fox, A.	Mernda	59
French, T. W.	Wollert	43
French, W.	Greenvale	51
Galbraith and Walker	Greensborough	36
Gamble Bros.	Greenvale	156
Gallus, E. A.	Doncaster	14
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	28
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	27
Harding, J. E.	Templestowe	42
Hargrave, Mrs. E. J.	Whittlesea	21
Harkness, H. J.	South Morang	31
Harmer, R. E.	Wollert	38
Hawkes, Miss D.	Warrandyte	21
Hehr, H.	Epping	32
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howden, A.	Epping	29
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	11
Jackson, Mrs. M.	South Warrnambool	6
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jones, S. E.	Campbellfield	23
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	28
Lane, J.	Warrnambool	9
Latta, Mrs. J.	Warrnambool	6
Levett, E.	Warrnambool	12
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McCulloch, A. A.	Warrnambool	28
McDonald, A. J.	Whittlesea	2
McDowell, R. H.	Greensborough	26
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Maltzahn, Mrs. E. N.	Campbellfield	45
Mason, N.	Donnybrook	52
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	6
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	44
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
O'Hern, T.	Epping	58
O'Keefe, J. P.	Warrnambool	21
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Patullo, F. E.	Mickleham	36
Pitson, R. H.	Yarrambat	17
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	49
Rawlings, J. H.	Whittlesea North	41
Righetti, L. A.	Lower Templestowe	40
Rodgers, E.	Whittlesea North	11
Rosewarne, Miss P.	Yan Yean	43
Seeber, B.	Thomastown	24
Shanks, John	Mernda	73
Shaw-Logan T.	Glenroy	103
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Simpson, W. G.	Donnybrook	12
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	81
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	31
Southon, H. W.	South Morang	60
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Thomas, Mrs. E.	Broadmeadows	11
Thomas, W. C.	Yan Yean	31
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Vallence, C. A.	Epping	11
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	17
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	33
Williamson, J.	Doncaster (High-st.)	4
Willis Bros.	Craigieburn	61
Wilson, J. E.	Diamond Creek	9
Wilson, Mrs. M.	South Morang	14
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Ziebell, H.	Thomastown	32

There are also 457 herds in which 13,438 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

Registered Fertilizers

Analyses and Unit Values

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1943.

	£	s.	d.
Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Fine Bone	1	0	0
,, as Nitrate	1	3	10
,, as Ammonia	0	17	10
Phosphoric Acid—			
as Water Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate	0	6	6
as Citrate Soluble	0	5	0
as Citrate Insoluble—			
in Superphosphate	0	2	0
in other Fertilizers	0	5	0
Potash—			
as Sulphate	0	9	3
as Chloride	0	8	0

Melbourne, 18th March, 1943.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1943.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrogenous—Readily Available.														
Nitrate of Soda	Sickle in diamond	15·50	..	..	..	..	15·50	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	15·50	..	..	..	..	15·50	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Cresco ..	15·50	..	..	..	..	15·50	..	..	..	..	..	18 10 0	Cresco Fertilizers Ltd., Little Malop-st., Geelong
Sulphate of Ammonia	M.G. Co. in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	18 10 0	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
,, ,,	Pivot ..	..	20·60	..	..	..	20·60	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond	..	20·60	..	..	..	20·60	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cresco ..	..	20·60	..	..	..	20·60	..	..	..	..	..	18 10 0	Cresco Fertilizers Ltd., Geelong
Moderately Available.														
Dried Blood ..	Fitzroy ..	..	..	13·00	..	..	13·00	..	..	..	..	..	13 0 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
,, ,, ..	T.B. & S. in diamond—Brooklyn	..	..	12·00	..	..	12·00	..	..	..	..	..	12 0 0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
,, ,, ..	T.B. & S. in diamond—Portland	..	..	12·00	..	..	12·00	..	..	..	..	..	12 0 0	Thomas Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
,, ,, ..	M.C.C. in diamond	..	..	12·00	..	..	12·00	..	..	..	..	..	12 0 0	Melbourne City Council, Town Hall, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1943—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Nitrogenous—Moderately Available.																
Dried Blood ..	Pannifex's	..	..	12·00	..	..	12·00	..	..	..	..	..	12	0	0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
,, ,, ..	Pannifex's (B)	..	..	13·00	..	..	13·00	..	..	..	..	..	13	0	0	,, ,, ,,
,, ,, ..	Champion ..	..	..	13·00	..	..	13·00	..	..	..	..	..	13	0	0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne
Blood Manure ..	Pentagon ..	..	..	10·50	..	..	10·50	..	..	..	..	..	10	10	0	Mulgrave By-Products Co., North-road, East Oakleigh
,, ,, ..	M.C.C. ..	..	..	8·00	..	..	8·00	..	..	..	..	..	8	0	0	Melbourne City Council, Town Hall, Melbourne
,, ,, ..	Pannifex's ..	..	..	8·00	..	..	8·00	..	..	..	..	..	8	0	0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster - terrace, North Melbourne
Slowly Available.																
Castor Meal ..	Alba ..	..	..	..	..	..	5·00 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Lycett Proprietary Ltd., Normanby-rd., Montague
,, ,, ..	Sweetsoil ..	..	..	..	..	..	5·00 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Sweetsoil Lime and Fertilizers Pty. Ltd., 379 Flinders-st., Melbourne
,, ,, ..	L.F.X. ..	..	..	..	..	..	5·00 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Rape Seed Meal	Alba ..	..	..	..	..	..	5·50 (as rape seed meal)	..	..	1·75	1·75	1·50	5	5	0	Lycett Proprietary Ltd., Normanby-rd., Montague
,, ,, ,,	Sweetsoil ..	..	..	..	..	..	5·50 (as rape seed meal)	..	..	1·75	1·75	1·50	5	5	0	Sweetsoil Lime and Fertilizers Pty. Ltd., 379 Flinders-st., Melbourne
Wool Waste ..	A.L.T. ..	..	..	..	..	..	3·85 (as wool)	..	..	·70	·70	·31	3	0	0	A. L. Thompson Pty. Ltd., 49 Grant-st., South Melbourne
Nitrogenous—Slowly Available—continued.																
Flesh, Hoof, and Treated Leather	No. 3 Fertillo	8.0 As Flesh Hoof and Treated Leather	..	..	..	..	8·00	..	..	..	..	..	8	0	0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
Phosphatic—Readily Available.																
Superphosphate 18 per cent.	Cresco ..	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Sickle in diamond	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Superphosphate 22 per cent.	Cresco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	6	1	0	Cresco Fertilizers Ltd., Geelong
Phosphate—Moderately Available.																
Basic Super. reverted	Sickle in diamond	..	..	..	..	..	..	..	12·10	3·20	15·30	..	6	1	3	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1943—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Flesh Hoof and Treated Leather.	As Ammonia.	As Bone.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Phosphate—Moderately Available.														
Basic Super. reverted	Pivot ..	..	..	..	..	..	..	..	12·10	3·00	15·30	..	6 1 3	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Potassic—Readily Available.														
Sulphate of Potash	Cresco ..	..	..	..	..	..	..	..	..	..	..	48·50	22 10 0	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	48·50	22 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48·50	22 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Muriate of Potash	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20 0 0	,, ,, ,,
,,	Cresco ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20 0 0	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20 0 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
MIXED FERTILIZERS. *Containing Nitrogen and Phosphoric Acid—Readily Available.*														
Super. and Ammonia	Cresco (3 and 1)	..	5·00	..	..	..	5·00	12·60	·30	·60	13·50	..	9 6 9	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (6 and 1)	..	2·90	..	..	..	2·90	14·30	·35	·75	15·40	..	7 18 0	,, ,, ,,
,, ,,	Pivot II. (3 and 1)	..	5·00	..	..	..	5·00	10·50	1·80	1·20	13·50	..	9 6 9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot I. (6 and 1)	..	2·90	..	..	..	2·90	12·00	2·10	1·30	15·40	..	7 18 0	,, ,, ,,
,, ,,	Sickle in diamond (3 and 1)	..	5·00	..	..	..	5·00	10·50	1·80	1·20	13·50	..	9 6 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (6 and 1)	..	2·90	..	..	..	2·90	12·00	2·10	1·30	15·40	..	7 18 0	,, ,, ,,
Nitro Superphosphate	Sickle in diamond	..	1·50	..	..	0·50	2·00	11·60	2·60	1·80	16·00	..	7 15 0	,, ,, ,,
,, ,,	Cresco ..	..	1·50	..	·50	..	2·00	14·40	·60	1·00	16·00	..	7 15 0	Cresco Fertilizers Ltd., Geelong
Moderately Available.														
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2·50	2·50	9·30	4·10	3·40	16·80	..	7 18 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Bone and Super.	Sickle in diamond, No. 1	..	..	..	..	2·00	2·00	8·00	4·20	5·60	17·80	..	7 17 0	,, ,, ,,
,, ,,	Cresco No. 1 ..	..	..	..	2·00	..	2·00	9·90	4·20	3·70	17·80	..	7 17 0	Cresco Fertilizers Ltd., Geelong
Super. and Bone	Cresco No. 2 ..	..	..	..	..	1·00	1·00	14·80	1·00	1·40	17·20	..	7 5 9	,, ,, ,,
,, ,,	Sickle in diamond, No. 2	..	..	..	..	1·00	1·00	11·80	3·10	2·30	17·20	..	7 5 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Flesh, Bone, Hoof, Treated Leather, and Superphosphate	Mixed Fertilizer, Fertillo No. 2	5·55	..	·20	..	..	5·75	2·00	2·00	6·00	10·00	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
Flesh, Bone, Hoof, and Treated Leather	Mixed Fertilizer, Fertillo No. 4	5·55	..	·20	..	..	5·75	..	4·00	6·00	10·00	..	8 0 0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1943—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*			Where Obtainable
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
MIXED FERTILIZERS. *Containing Nitrogen and Phosphoric Acid—Moderately Available*—cont.		%	%	%	%	%	%	%	%	%	%	%				
Blood and Bone	Sickle in diamond	..	..	..	..	5·00	5·00	..	5·00	9·00	14·00	..	8	0	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (No. 2)	..	..	..	..	7·25	7·25	..	6·00	7·00	13·00	..	9	10	0	,, ,, ,,
,, ,,	J. A. Dundas'	..	..	..	..	4·50	4·50	..	7·14	13·61	20·75	..	9	13	9	J. A. Dundas, Dynon-rd., Footscray
,, ,,	Corio ..	..	..	..	4·50	..	4·50	..	6·00	8·00	14·00	..	8	0	0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-st., Geelong
,, ,,	Fitzroy Special	..	..	..	..	5·00	5·00	..	13·00	5·00	18·00	..	9	10	0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
,, ,,	Premier ..	..	..	..	..	7·00	7·00	..	6·50	5·50	12·00	..	10	0	0	,, ,, ,,
,, ,,	Murray ..	..	..	..	5·25	..	5·25	..	4·50	7·50	12·00	..	8	5	0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
,, ,,	Pridham's ..	..	..	..	5·10	..	5·10	..	6·00	8·00	14·00	..	8	12	0	W. Pridham Pty. Ltd., Evans-st., Braybrook
,, ,,	Ibis ..	..	..	..	..	5·50	5·50	..	5·25	5·00	10·25	..	8	0	0	Ficken, Halliday, and McClelland Pty. Ltd., 634 Bourke-st., Melbourne
,, ,,	P.M. ..	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	10	0	0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
,, ,,	Solo ..	..	..	..	..	7·00	7·00	..	4·25	10·75	15·00	..	10	15	0	,, ,, ,,
,, ,,	Cockatoo ..	..	..	..	..	5·18	5·18	..	10·97	8·00	18·97	..	8	10	0	R. Fordham, Cressy-rd. Camperdown
,, ,,	Cresco ..	..	..	..	..	7·00	7·00	..	5·00	4·00	9·00	..	9	5	0	Cresco Fertilizers Ltd. Geelong
,, ,,	Echuca ..	..	..	..	..	4·83	4·83	..	8·17	7·65	15·82	..	8	15	9	Echuca Freezing Works, Goulburn-rd., Echuca East
,, ,,	Champion ..	..	..	..	6·00	..	6·00	..	6·00	6·00	12·00	..	9	0	0	Sims Cooper (Freezing Works) Pty. Ltd., Henty House, 499 Little Collins-st., Melbourne
,, ,,	Fitzgerald's ..	..	..	..	5·00	..	5·00	..	8·50	6·50	15·00	..	8	15	0	P. Fitzgerald and Sons, Oakleigh
,, ,,	T.B. and S. in diamond (Portland)	..	..	..	6·00	..	6·00	..	7·00	5·00	12·00	..	9	0	0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
,, ,,	T.B. and S. in diamond No. 1 (Brooklyn)	..	..	..	6·00	..	6·00	..	7·00	5·00	12·00	..	9	0	0	,, ,, ,,
,, ,,	Apex ..	..	..	..	..	5·00	5·00	..	7·00	8·00	15·00	..	8	15	0	North-Eastern Bone Products, Wangaratta
,, ,,	Pannifex's (A)	..	..	..	..	7·00	7·00	..	6·00	8·00	14·00	..	10	10	0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster - terrace, North Melbourne
,, ,,	Pannifex's (B)	..	..	..	..	7·00	7·00	..	3·00	4·00	7·00	..	8	15	0	,, ,, ,,
,, ,,	Pannifex's (C)	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	8	10	0	,, ,, ,,
,, ,,	Pannifex's (D)	..	..	..	..	5.00	5·00	..	4·00	6·00	10·00	..	7	10	0	,, ,, ,,
,, ,,	Pannifex's (E)	..	..	..	..	8·00	8·00	..	3·00	5·00	8·00	..	10	0	0	,, ,, ,,
,, ,,	Pannifex's (F)	..	..	..	..	5·39	5·39	..	6·87	9·50	16·37	..	9	9	6	,, ,, ,,
,, ,,	Valley ..	..	..	..	..	6·32	6·32	..	2·81	2·40	5·21	..	7	12	0	Goulburn Valley Freezing Works, Shepparton
,, ,,	Arch No. 1 ..	..	..	..	7·00	..	7·00	..	7·00	4·00	11·00	..	9	15	0	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 54 Market-st., Melbourne
,, ,,	Arch No. 2 ..	..	..	..	7·00	..	7·00	..	7·00	4·00	11·00	..	9	15	0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1943—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
COMPLETE FERTILIZERS. *Containing Nitrogen, Phosphoric Acid, and Potash—Readily Available*														
Complete Fertilizer	Sickle in diamond (Market Garden)	..	1·70	..	..	1·50	3·20	8·50	3·20	3·00	14·70	2·42	9 18 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (A) (5.1.1.)	..	2·90	..	..	..	2·90	10·00	1·80	1·10	12·90	6·90	10 14 0	,, ,, ,,
,, ,,	Sickle in diamond (C) (4.4.1.)	..	9·15	..	..	..	9·15	6·20	1·10	·70	8·00	5·39	14 5 0	,, ,, ,,
,, ,,	Pivot IV. (5.1.1)	..	2·90	..	..	..	2·90	10·00	1·80	1·10	12·90	6·90 as sulphate	10 14 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Cresco (Market Garden)	..	1·70	..	1·50	..	3·20	11·90	1·10	1·70	14·70	2·42	9 18 9	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco, No. 2 (4.4.1)	..	9·15	..	..	..	9·15	7·40	·20	·40	8·00	5·39	14 5 6	,, ,, ,,
,, ,,	Cresco, No. 3 (5.2.1)	..	5·15	..	..	..	5·15	10·48	·25	·51	11·24	6·06	10 4 5	,, ,, ,,

Bonedust.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust ..	Apex ..	3·25	20·00	50·0	50·0	8 5 0	North-Eastern Bone Products, Wangaratta
,, ..	Mount Clear ..	3·00	19·00	50·0	50·0	7 15 0	Bailey Bros., Mount Clear
,, ..	Pannifex's ..	3·50	19·00	50·0	50·0	8 5 0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster—terrace, North Melbourne
Bone Flour ..	Fertillo ..	1·00	32·50	95·0	5·0	9 2 6	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 18th March, 1943.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Prosecutions Under Sheep Dipping Act

On the 16th of February, 1943, at the Flemington Court of Petty Sessions, John Edward Doyle was convicted and fined £3, for an offence under Section 10 of the Sheep Dipping Act. Evidence was given by Stock Inspector J. E. Carroll, that he discovered at the Newmarket Saleyards, 100 crossbred ewes the property of the defendant infested with sheep ticks.

Under Section 10 of the Act, a maximum penalty of £5, for an offence of bringing sheep infected with lice or ticks into any saleyard.

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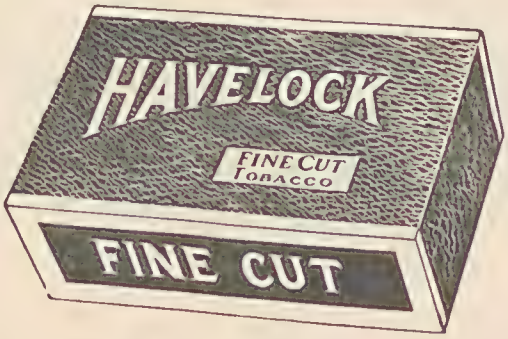

HAVELOCK

Fine Cut Tobacco

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

BLUE PEA PRODUCTION IN VICTORIA

By FRANK M. READ, M.Agr.Sc., Chief Inspector of Horticulture

BLUE peas, sometimes known as Blue Boilers, are required in very large quantities for the Defence Services, as they constitute a nutritious food easy to transport and a valuable addition to the supply of fresh, canned or dried vegetables, particularly in areas remote from the centres of vegetable production.

Although such dry peas are comparatively little known in this country, as packet peas, they have been a popular food in England for a long time. They normally require between 24 and 48 hours' soaking prior to cooking to ensure palatability, and there is reason to believe that the relative unpopularity of these peas on the menus of the fighting services in this country is due almost entirely to the fact that cooks do not handle them correctly. They must be soaked before cooking. The nutritional authorities associated with the Defence Services have pointed out further that, if blue peas are soaked for a longer period up to about four days, the vitamin content is enormously increased. By this time the radicle or primary root is about 1 inch long and doubtless consumers, whether in the services or elsewhere, will need to adjust themselves to the eating of such sprouted peas. This should not be beyond their powers. For the time being Blue peas are not available for civilian purposes, except occasionally when military demands permit, and so it is more with the production of these peas than their consumption that Victorians are at present concerned.

Contracts for 1943-44 Season

The Victorian Department of Agriculture is now commencing to place contracts on behalf of the Field Peas Board for the production of Blue peas in Victoria this year. The price offered under contract is 15s. per bushel for "A" grade peas, with a reduction for blemish in excess of the "A" grade limits. The Victorian crop last year was valued in the main at between 13s. 9d. and 14s. 6d. per bushel, although a number of crops gave higher returns, while some were a few pence lower. These prices, of course, are paid for the weight of peas delivered, and not on the weight remaining after cleaning. They give a quite profitable return where growing conditions are satisfactory and are a substantial advance on prices ruling before the war. Under present conditions, yields as low as 15 bushels per acre are economic when farm operations are well mechanized.

Under National Security Regulations the whole of the 1942-43 crop was compulsorily acquired by the Commonwealth Government, with the exception of peas needed for the growers' domestic use or for sowing the 1943-44

Sheffield—One of the Tasmanian districts in which highest yields and quality of Blue peas are obtained.

crop. It is expected that most growers saved sufficient seed; but those who did not, and new growers who now complete a contract, may purchase on application to the Department of Agriculture Blue peas of seed grade at 16s. per bushel, f.o.r. Melbourne. Last year, seed was advanced to growers against crop returns, but this year the Commonwealth Government's decision is that contract growers will be required to pay for the seed within 21 days of consignment. Seed grade peas may be found to be somewhat soil-stained, or to carry a small percentage of grub-damaged peas; but they will have a high percentage germination and be quite good seed.

Sowing Rate and Time

For growers not familiar with the crop, the following general guide may be of assistance. It is based on Victorian experience last year and a study of Tasmanian practice in pea-growing districts.

On rich soil, with a climate providing an annual rainfall of 30 inches or over and good finishing rains, a seeding rate of 2½ to 3 bushels per acre is advisable, while on the lighter soil types and in lower rainfall areas of southern Victoria 2 to 2½ bushels would be ample. Farmers north of the Divide will find 1½ to 2 bushels sufficient. In general, crops sown before the end of June may be seeded half a bushel lighter than those sown from mid-August on.

As a high yield of Blue peas depends on showers at and after flowering time, sowing should be made in April north of the Divide to permit harvesting to be completed in November; and when possible before June in the drier southern areas. However, since Blue peas will not tolerate wet soil conditions, August to October sowing must be resorted to where the soil is wet during the winter months.

In general, peas require just sufficient soil moisture to germinate them and maintain steady growth up to blossoming, and Blue peas are no exception to this rule. During this period, rather dry conditions are preferable to excess moisture, which usually results in serious fungal attack by Septoria or Ascochyta blight —diseases which are common in Victorian peas causing stunting, yellowing, and premature drying off of the plants by attacking primarily the lower parts of the stem.

Peas are not very susceptible to frost, except at the blossoming and young pod stage, when damage can occur. This risk can be accepted by growers.

From blossoming to the completion of pod development light showers at intervals of one to two weeks provide ideal conditions for high yield of quality peas. When the pods are well filled, dry conditions are necessary to facilitate harvesting and hold the standard of quality, for rain at this period is the main cause of bleaching.

It is not suggested that all growers are likely to experience the above exacting conditions in their locality, but by adjusting their planting date they can do a great deal. Last year's growers have their experience to guide them in

this regard, and new growers can base their sowing date on their knowledge of Dun peas. Blue peas should be sown, generally, two to four weeks before Duns in the northern pea districts, and also in drier parts of southern Victoria. In northern Victoria, the growing period for Blue peas is about the same as for Duns, but Blues need to come in earlier, as they do not finish as well in hot weather. In the south of Victoria, last season, they took a week or two longer to mature than Duns.

Superphosphate

As Blue peas are a high priority crop, superphosphate is available for sowing with the peas if growers who have signed a contract make application for their reasonable needs. The Fertilizer Rationing Section of the Department in allocating superphosphate to Blue pea growers will take into account the sowing rate and the type of soil on the farm concerned. Generally speaking, a half a bag to 1 cwt. per acre is recommended when sowing rates do not exceed 2 bushels of peas; while up to a bag of superphosphate per acre may be used with higher sowing rates of 2½ to 3 bushels, because such sowings are made on higher yielding pea land.

Results in 1942-43

The effort to produce Blue peas in Victoria last year was successful in that the estimated yield for the whole of the State was exceeded.

Before 1942 Blue peas had been grown extensively in Tasmania, but, in Victoria, by one or two growers only. Last year, however, as a result of an appeal by the Commonwealth Government to Victorian farmers, about 150 growers planted between them 3,800 acres, of which 1,300 were destroyed or very seriously attacked by cutworms, leaving 2,500 acres from which most of the Victorian crop was gathered. All peas have not yet been delivered, but about 14,000 bags should be harvested. To-day, the Blue pea is a crop definitely established in Victoria, and one with which farmers generally are becoming familiar.

Production in the southern part of Victoria, principally the Western district, on the whole was very satisfactory. Crops ranged from about 12 bushels to 50 bushels per acre. On good pea-growing country, such as Koroit, the bulk of the area yielded well over 30 bushels per acre, while on the lighter and somewhat drier soil types, for instance, in the region of Hamilton, yields were more in the vicinity of 18 to 20 bushels to the acre. In Western Gippsland, notably the Koo-wee-rup swamp, the crops generally did well, although excessive November rain did some damage. Yields of up to 30 bushels per acre were obtained and, doubtless, could be greatly exceeded in parts of this district where inexperience in harvesting greatly reduced the quality and the yield.

The 1942 results were unsatisfactory to growers in the north of the State, because of attack by cutworms, which were very much more serious in northern Victoria than normally. If it had not been for cutworm attack there is no question that returns from Blue peas at Yarrawonga and Dookie would have been very satisfactory. The crops grew well, and were podding satisfactorily when the cutworms appeared.

Cutworms

The entomologist, Mr. R. T. M. Pescott, who examined the affected crops, noted some damage from Looper caterpillars, Meadow Argus caterpillars and Tomato Moth caterpillars, but found most damage due to the well-known climbing Army Worm caterpillars, or Climbing Cutworms as they are more usually called. These insects spend most of their time on the plant chewing the leaves and pods, as distinct

A heavy crop of blue peas at Westbury, Tas., showing two or three shoots per plant, and ten to twelve well-filled pods. Yield was estimated at 50 bushels.

Top—A climbing cutworm at work.
Lower—A cutworm moth (slightly enlarged); watch for it in September.

from the ordinary cutworm, which resides in the soil and emerges only at night to attack the base of the plant.

Because of their climbing habit the climbing cutworms cannot be controlled by baiting; dusting the crop with a poison, either arsenate of lead or derris, being the only method of attack open to the grower. Last year, dusting was carried out at a cost of about 20s. per acre for material, but was of only limited success, as it was applied after the grubs were established in the crop. At this stage many were already feeding on the peas inside the pods and could not be reached by the dust. The entomologist points out that these grubs hatch out from eggs laid by cutworm moths which can be seen flying through the crop usually in September, and that dusting as a control would need to be applied a few days after the moths appear and before the grubs were established.

Observations made after dusting last year suggested that the presence of dust on the plant deterred the grub from attacking, and it would be of value to experiment with a cheaper non-poisonous dust to see if the crop could be made unattractive to the insects by this means.

In many cases a straight-sided furrow ploughed around a field proved of great value in preventing the movement of grubs from one field to another. It was also noted that many grubs were parasitized by wasps, and also, it seems, by a disease known to attack them.

Harvesting

Considerable experience has been gained as a result of the 1942-43 season. Previously, although Blue peas had not been grown in Victoria to any extent, considerable areas of Dun peas had been sown, and most had been direct harvested in one operation, using a wheat header harvester fitted with a pea attachment. For such direct harvesting the crops were allowed to fully ripen in the field and dry off.

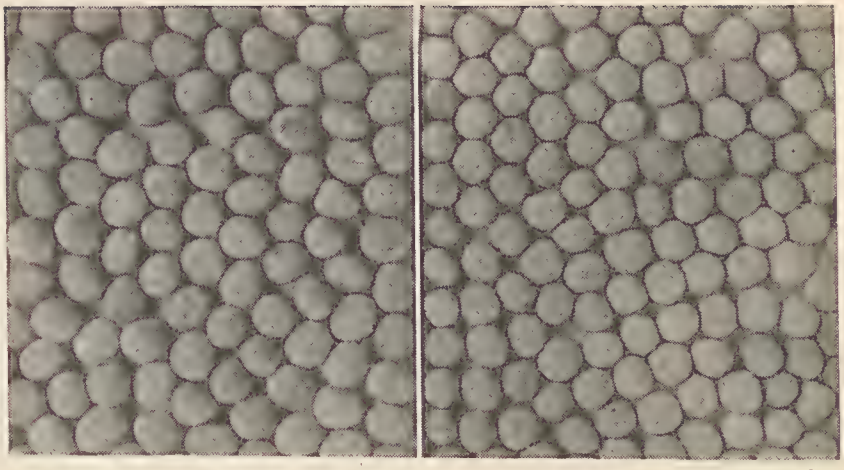
Tasmania had produced considerable quantities of Blue peas of good quality, and producers in that State held the opinion that Blue peas could not be handled in a similar manner to Duns, owing to the likelihood of a fall in quality and the danger of excessive shelling out or shattering of the mature pods prior to or during harvesting.

The quality of Tasmania Blue peas is something beyond that attained to date in Victoria, but it is not certain that this can be attributed mainly to harvesting methods. Climate and soil conditions play an important part. The main area embracing Devonport, Sheffield, Deloraine consists of rich loams of volcanic origin and a rainfall of over 30 inches, which provides ample summer showers for the filling of the pods. Smaller zones at Wynyard and Smithton enjoy similar natural advantages. Even the Launceston-Longford region of lighter sedimentary soils, which Tasmanians do not regard as ideal pea country, but which now is growing about one-third of Tasmania's crop,

Carting Blue peas to the stationary threshing machine or "drum" at Deloraine, Tasmania.

has a rainfall of 25 inches, with an incidence generally favourable to the maturing crop.

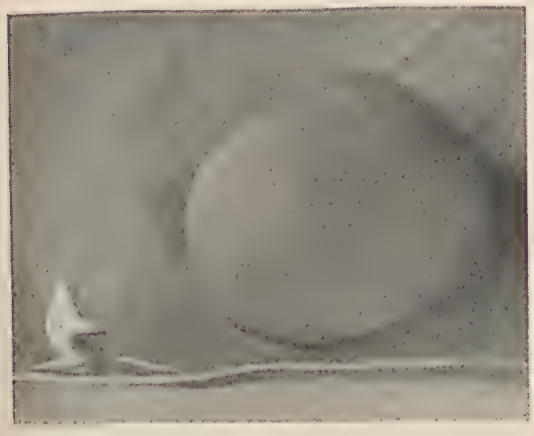
The standard method of harvesting in Tasmania has been to mow the crop when most of the pods are yellow-green and of a parchment appearance. At this stage the leaves are still green and many of the less mature pods still green with their peas fully grown, but not yet changed in colour from green to blue. Such crops are allowed to cure in the field for a week to ten days.



The main variety, Blue Prussian (right) is definitely smaller than Dutch Blue (left), which shows promise in the drier Victorian districts.

The writer's observations suggest that if the peas, on being detached from the pod, leave behind adhering to the pod the small seed stalk with its shield-shaped base, the pea is sufficiently mature to develop on curing to full quality. It has previously been thought in Victoria that the peas had to develop beyond this stage and show a change in colour from green to blue before being ready to mow. Some very successful growers of high quality peas in Tasmania, however, consider that better results have been obtained by mowing the crop in a much more mature condition, so that only two days are necessary for field curing between mowing and threshing, that is to say, by letting the crop mature as far as possible short of risking shattering of the pods during mowing.

Although growers seem to have crop lifters or fingers to attach to the mower, most do not normally need to use them, presumably because the crops up to this stage do not lodge seriously. All mowers, however, are fitted with the curved pea bars for rolling the crop behind the mower.



Blue peas are fit to mow when, on the pod being opened, the peas are readily detachable from their stalks, which should remain attached to the pod. At this stage they may still be green. Such peas must cure in the field for one to two weeks after mowing.

After curing, when the pears are quite dry, they are either stacked and later threshed from the stack by a travelling contract thresher or "drum," or, more usually, carted direct to the "drum," which is pulled into the field. The trash from the "drum" is stacked for fodder purposes.

By this method a well-dressed high-quality sample of peas is usually obtained, although cutting the crop too immature may give an excess of shrivelled peas, and rain during the curing period may cause bleaching of the colour. The great disadvantage is the amount of labour required, for apart from the labour of mowing and carting, not less than about twelve men are needed to operate the threshing plant for a daily output of peas not vastly greater than is bagged in a day by two or three men operating a direct harvesting machine of the types common in Victoria.

As a result of the present shortage of farm labour, Tasmania is turning to direct harvesting, and is likely to be forced further in this direction. It is, therefore, of the greatest importance to observe that from recent opportunities for comparison of the two methods, it is clear that the quality of peas direct harvested need not be in any way inferior to the peas mowed and threshed. In fact, there is some reason to think that colour will be slightly better from direct harvesting under favourable conditions, although the sample may not be so well cleaned and may require a little more attention at the seed-cleaning house.

The bulk of Victorian Blue peas were direct-harvested last season by the two types of machine illustrated below. The top picture of the group illustrates the wheel driven wheat-header most commonly used in Victoria, fitted with a "pea front," and when the crop is fairly uniform and not very heavy or weedy, this machine has done very satisfactory work for the farmer with up to 40 acres.

The illustration at left is of a larger machine, an engine-functioned reaper-thresher, which may be fitted with crop lifters and lowered to ground level for direct harvesting of peas. It is capable of harvesting at a conservative estimate, 200 acres of peas a year. Both of these machines mow and thresh, that is direct-harvest, the thoroughly dry mature crop in one operation.

On the right another method is illustrated. Here the header harvester is fitted with a "pea pick-up." It must be preceded by a mower, which may be used about ten days before picking up or just ahead of the pick-up. Both methods have been successfully used, the former being an attempt to approximate to the normal Tasmanian practice of cutting green and curing the latter to approximate direct harvesting.

Possibly the most efficient method of direct harvesting has been developed by northern Victorian farmers, who have fitted an ordinary mower with crop lifters to the "pick-up" machine. The mower is powered from the tractor, and works a few inches in front of the "pick-up." Where the ground is level and free from stones and stumps this is an excellent outfit, which greatly impressed progressive Tasmanian growers, and is likely to be extensively used in that State.

The threshing units of the machines described above may be—(*a*) wheel driven, (*b*) powered by a take off from the tractor, (*c*) engine functioned. The threshing speed of the first two is dependent on the ground speed of the machine, and although the relation between the two may be varied by changing appropriate sprockets, this takes some time. Engine-functioned headers on the other hand having a separate small engine mounted on the machine for threshing power can vary threshing speed rapidly at will, can slow up until the machine clears itself, and, of course, can be used conveniently as a stationary thresher. This is a great advantage, especially in heavy crops or variable ones including, for instance, mown crops which have been blown about by wind. On the whole, in good pea country where heavy crops are expected, the additional expenditure for an engine-functioned machine seems wise.

It has been said that direct harvesting is capable of producing peas of high quality;

Top—Wheel-driven "header" fitted with "pea front". Crop has been removed from front of machine to show the crop-lifters. Left—A reaper-thresher which can be fitted with crop-lifters and lowered to ground level for direct harvesting of peas. Right—A pea "pick-up" fitted to an engine-functioned harvester. This must be preceded by a separate mower or may have a mower blade fitted a few inches in front of the "pick-up".

but it needs to be said with emphasis that the quality of many peas in Victoria last harvest was ruined during this operation. This is particularly noticeable in the most favoured districts with red chocolate soils and high rainfall. Apparently the machines have been thoroughly coated with dust which, under humid conditions, has adhered to and seriously soiled the peas. Unless the grower can retain that bloom which the peas possess as they leave the pod he is failing in the direct harvesting of Blue peas, which must be attractive as they leave the farm. It may simply mean that threshing is performed on humid days, or too early and too late in the day. This fault was not noticed until after harvest when peas were being received into store, otherwise detailed observations could have been made.

Varieties

The main variety grown last year in Victoria was Blue Prussian. In some crops it was noted, however, that a pea of quite different character, paler green in colour, much larger in the leaf, pod, and seed occurred in strips through certain crops, indicating that bags of a different variety had inadvertently been included in the seed supplied to Victoria. Subsequent inquiry has shown that this is known in Tasmania as the Dutch Blue, having been imported into that State from Holland a few years ago to meet a shortage of seed. It would seem to be of great interest to growers in the drier Victorian districts, because it has a growing season about two weeks shorter than the Blue Prussian. It produces a fine bold pea of good eating quality, but under Tasmanian conditions has not gained in favour, because it is more prone to bleaching than the main variety. There is every possibility that under direct harvesting conditions in Victoria this defect would not be important, and trials on a commercial scale will be made in the 1943-44 season. The Dutch Blue should not be confused with the stranger which was noticed in practically all Blue Prussian crops last year. This stranger was taller, rather larger in leaves and stipules, but had pods and peas of about the same size. It was no earlier in maturity than the majority of the crop, and if it is not simply a strain of Blue Prussian its identity is not yet known.

Another Blue pea of interest is the newly-raised New Zealand variety, Mammoth Blue, said to be a cross between Blue Prussian and Harrison's Glory. This new Blue pea is nearly twice the weight of Blue Prussian, but being a little later in ripening may not be suited to most parts of this State. However, it is hoped that small trials will be made this year.

Victorian growers can produce Blue peas. In their first attempt they have overcome the expected difficulties rather better than was anticipated; but they have now to realize very clearly that yield in a commodity of this type is not enough. The peas must be of good quality, or they simply will not be usable as boiling peas. Every care must be taken by every grower to see that the highest possible quality is reached and the crop, when bagged, is a credit to this State.

Clipping of Horses.

There is every reason why working horses should be clipped during the winter. Horses working at a walk are usually clipped trace high, i.e., on the legs and belly only, but horses working at a faster pace require a more extensive clipping.

Under natural conditions the horse's thick winter coat provides him with an extra warm covering when the weather is cold and food is scarce. The extra warmth of the long thick hair, added to the increased greasiness always found under a heavy ungroomed coat, keeps the body warm and helps considerably to maintain weight and condition. If, however, horses are required to work hard, the heavy coat becomes a distinct drawback, adding considerably to the exhaustive nature of the labour, keeping the animal in a constant sweat, and preventing rapid drying of the skin after exertion. As a result, a loss of condition is inevitable. On the other hand, a clipped horse not only maintains condition, but is capable of a greater amount of work with less distress, and is, moreover, dried and cleaned with much less labour and risk of chills.

Apart altogether from its beneficial effect on the horses condition and working power, clipping enables wet and dirty animals to be dried and cleaned more quickly, more thoroughly, and with less labour. To attempt to dry and clean muddy, soaking, heavy-coated horses is a futile and heart breaking end to a day's work.

FERTILIZER RATIONING NOTES

Supplementary Ration for Dairying and Irrigated Pastures now available

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

A LIMITED supplementary ration of superphosphate is now available to bona fide dairy farmers and for irrigated pastures and lucerne.

Special rations have been allotted to growers of first priority crops such as vegetables, potatoes, and flax, but the ordinary ration for non-priority crops and pastures in 1942-43 is the equivalent of only one-third of that normally used by each farmer.

In view of the special war-time importance of whole, condensed, and dried milk, and of cheese, and because of the important part played by irrigated pastures, particularly in dry seasons, the small residue of the superphosphate allocated to Victoria is to be used for dairying and irrigated pastures.

Dairy Farms.

The supplementary ration for dairy farmers is based on the quantity of cream or milk produced and sold by each farmer in the half-year ending 31st December last. One bag of superphosphate is allowed for each 200 lb. of butterfat (or portion thereof) where the milk or cream was sold on a butterfat basis, or for each 500 gallons of milk sold on a gallon basis.

By arrangement, the butter and milk factories, the milk depots, the Milk Board, and other receivers of milk or cream will certify on a special application form to the quantities of butterfat or milk involved, and will then post the form or make it available to each farmer concerned. Farmers should then include the particulars required, sign the form, and lodge it as an order with their usual supplier of superphosphate. Orders received after 31st May may be forfeited. The application forms will be examined and checked by the Fertilizer Section of the Department of Agriculture.

The supplementary ration is available in the first instance to bona fide dairy farmers who sold more than 1,000 lb. of butterfat or 2,500 gallons of milk in the six months ending 31st December last. The minimum ration therefore will be six bags. All other cases of bona fide dairy farmers will be considerd by the Department on application being made. The maximum supplementary ration will be 4 tons, except in certain circumstances provided for. Dairy farmers with irrigated pastures will use the special form provided for them.

Irrigated Pastures.

The supplementary ration for irrigated pastures, including those used for dairying, is based on the acreage of irrigated pastures and/or lucerne which is effectively graded and checkbanked, and which has been regularly top-dressed, the allowance being one bag of superphosphate for each 3 acres certified to by the District Officer of the State Rivers and Water Supply Commission.

The Commission has already posted application forms to practically all those entitled to the ration, but any irrigator of pastures not in receipt of a form may apply to the Commission or to the Fertilizer Section of the Department of Agriculture, 81 Collins-street, Melbourne. The form should be completed, signed, and forwarded immediately to the District Officer of the Water Commission for certification. It will then be sent to the Department of Agriculture, which will issue the necessary authority to the fertilizer company concerned to supply the allotted ration.

Should a dairy farmer with irrigated pastures consider himself entitled to a greater supplementary ration as determined on the production basis, he may appeal to the Fertilizer Section, stating the name of the factory to which he delivered his milk or cream.

Applications must be made by the 31st May, but farmers are advised to apply immediately they obtain their forms in order that they may obtain early delivery. Any farmer eligible for the supplementary dairying or irrigated

pasture ration who has not received his application form by the 10th May should refer his case to the Fertilizer Section of the Department of Agriculture.

The supplementary ration is available only to farmers who obtain their superphosphate rations from Victorian manufacturers or their distributors, and the order should be given to the usual supplier.

Rations of Wheat Farmers

A number of wheat farmers have complained that they are unable to obtain their ration because they formerly bought their superphosphate through another farmer who now claims that he requires all he can obtain for his own use. It is against the principles of the rationing plan that such incidents should occur, and action may be taken against those farmers who obtain more than their just share by not making available the superphosphate which rightly belongs to others.

The position was made quite clear in a press statement issued by the Department in February last, and reprinted in the March issue of this *Journal*. The statement reads as follows:—

"The rationing plan provides that consumers should obtain their superphosphate from the agent or person who supplied them last year. When the superphosphate was obtained from another farmer, this practice should be continued. Farmers who purchased on behalf of others in the past must make available to them the appropriate share of the ration. Farmers concerned in such an arrangement, who experience difficulty in obtaining their share of superphosphate, should report the case fully and immediately to the Department. The ration is based on the amount of superphosphate used on the particular property in the past, i.e., the ration goes with the land. Any farmer who sells or leases his property should transfer to the new occupier the appropriate ration which rightly belongs to the particular property. Farmers who acquire land therefore should take steps to have the appropriate ration transferred to them."

A number of complicated cases regarding the rights of land owners and share-farmers have been brought under notice, and such are inevitable when share-farmers move from one land owner to another. When such cases are fully explained to the Department, an endeavour is made to resolve them, but the solution could be reached voluntarily between those concerned. If it is remembered that the ration available for a wheat farm is only one-third of that normally used, it should be possible to arrange an equitable distribution without referring the matter to officers of the Department who cannot, at a distance, readily ascertain the full position, particularly when all the facts are not disclosed.

It has been emphasized for many months that any farmer who cannot obtain one-third of the quantity of fertilizer he normally uses on his farm may appeal to the Fertilizer Section of the Department of Agriculture, but those appealing at this late stage must be responsible for the delay which will occur while the case is investigated.

Sales of Fertilizer by Auction

The National Security Regulations provide that sales of artificial fertilizers may be made only with the approval of the Director of Agriculture. Approval for private transactions, other than those from the usual private suppliers mentioned above, and sales by auction may be given if the circumstances warrant them, and subject to the names of the purchasers being supplied to the Department. The Prices Commissioner has ruled that the price paid must not exceed the cost to the vendor. In cases where the sale is made because of a change in ownership of a property, the incoming farmer has the first right of purchase, as "the ration goes with the land." Disputed cases should be referred to the Department of Agriculture for decision.

Fertilizer for Priority Crops

Growers of priority crops such as vegetables, potatoes, and blue peas may still apply for their ration to the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne.

Flax growers should have already obtained an application form from the manager of the flax mill to which the flax is delivered.

All farmers, including growers of priority crops, are expected to order their rations early, and the usual custom of taking delivery shortly before the superphosphate is to be used cannot be adhered to. Growers who persist in withholding their orders or applications until just before they expect to use the fertilizer do so at their own risk.

Potato Seed Certification

List of Growers, 1943

By G. H. MATTINGLEY,
Potato Field Officer

THE Potato Seed Certification Scheme was established in Victoria in 1938 with the object of raising the standard of potato growing in the State by stimulating the production and distribution of high quality seed.

Crops which qualify for certification must pass two field inspections by a Departmental officer. The first inspection is made when the plants are about 8 weeks old and the second three to four weeks later. If any undesirable plants are in evidence at the first inspection these are pointed out to the grower, who must remove them from the crop. More than 10 per cent. foreign varieties and or diseased plants results in disqualification. The second inspection, which coincides with flowering time, gives an opportunity to check varietal purity and to determine whether rogueing of diseased plants has been done thoroughly.

After harvest the potatoes are subjected to the normal potato inspection and, if satisfactory, are stamped with the Government seal. It is pointed out that no potatoes are "certified" unless the bags bear stamped seals and official tags signed by the inspector.

The following list sets out growers whose crops have passed field inspection and who, subject to tuber inspection, will have certified seed for sale :—

LIST OF GROWERS OF CERTIFIED SEED POTATOES, 1943.

Name.	Address.	Acres.
Early Carman.		
Auchterlonie Bros.	Narracan	19
Allen, J. M. and R.	Wheelan's Loose Bag, Leongatha	5½
Cromb, A. E.	Dee River-road, Millgrove	2¾
Collery, Jas.	Kerrie	12
Collery, John	Hesket	10
Gunn, M.	Thorpdale	1
Knox, Jos.	Weeaproinah	1
Mayo, L. C.	Thorpdale	10
Mayo, R. S.	Stony Creek	6
Spring Bros.	Romsey	40
Powell, H., and Son	Thorpdale	18½
White, J.	"Elnaam," Neerim	1
Wilson, V.	Neerim Junction	4
Up-to-Date.		
Bellchambers, F.	Beech Forest	2
Brown Bros.	Wyelangta	8
Congram, W. J. P.	Beech Forest	15
Deppeler Bros.	Beech Forest	15
Knox, Jos.	Weeaproinah	8
Minchinton, E. A.	Weeaproinah	7½
Perry, J. A.	Beech Forest	9
Skinner, F. T.	Ferguson	4
Tann, W. H.	Weeaproinah	1½
Towers, A. J.	Beech Forest	1
Webster, S.	Lavers Hill	2
Katahdin.		
Exton, C., and Sons	Kinglake	6
Giles, A. W.	Koo-wee-rup	12
Late Carman.		
Bellchambers, F.	Beech Forest	2½
Brown Bros.	Wyelangta	4
Late Carman—*continued.*		
Butler, J.	Weeaproinah	3
Congram, W. J. P.	Beech Forest	5
Fry, J. G.	Beech Forest	5
Knox, Jos.	Weeaproinah	10
Meehan, B. P.	Beech Forest	2
Minchinton, E. A.	Weeaproinah	5
O'Brien Bros.	Weeaproinah	6
Skinner, F. T.	Ferguson	4
Tann, W. H.	Weeaproinah	2
Towers, A. J.	Beech Forest	8
Young, R. and A.	Weeaproinah	2½
Collery, John	Hesket	8
D'Arcy, F. F.	33 Collins-street, Melbourne	10
Leggo, G. R.	Italian Hill, Dayles-ford	10
Spring, Bros.	Romsey	4
Gunn, M.	Thorpdale	5
Lundy, W. A.	Erica	2½
Wheeler, J.	Trafalgar	2
Easdown Bros.	Kinglake	9
Exton, C., and Sons	Kinglake	34
Exton, A. P.	Pheasant Creek	3
Hawkins, E. T.	Kinglake	14
Owen, F. J., and Sons	Pheasant Creek	6
Toohey, F.	Kinglake	18
Toohey, J.	Pheasant Creek	6
White, J.	"Elnaam," Neerim	3
Wilson, V.	Neerim Junction	4
Snowflake.		
Collery, Jas.	Kerrie	7
Collery, John	Hesket	4
Gooch Bros.	Wheatsheaf	18
Labbett Bros.	Clarke's Hill	40

[*Leader photo.*

The Beef Industry

Methods of Production

By
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer.

IN Victoria beef is mostly produced in conjunction with some other rural enterprise, and there are few farms maintained solely for beef production. Possibly, nearly half the beef is produced in conjunction with, or as a by-product of dairying and the other half mainly in conjunction with or as a sideline to sheep farming.

Where there is dairying, beef will always be produced, but where Jersey and allied dairy breeds are kept beef really becomes a by-product. However, with dual-purpose breeds, like the Milking Shorthorn and Red Poll, beef production should be a major function of the farm.

Beef versus Dairying

The difference between beef production and dairying is mainly one of labour, and the man with a limited capital cannot secure a large enough property to earn a living solely by producing beef. Generally, the gross income per acre is twice as great on a dairy farm, and one and a half times as great on a sheep (wool and fat lambs) farm as it is on the beef farm.

With beef production, a larger amount of capital is tied up, and the returns come in at the end of one, two, three, or four years, depending upon whether vealers or bullocks are produced. With dairying, the returns are received monthly.

In practice, comparisons drawn up on paper do not always work out, and, therefore, in the following paragraphs showing annual returns from dairying and beef production amendments to fit particular cases should be made.

Generally, a beef cow can be grazed and her calf fattened as a vealer (nine to ten months) on the same area as a dairy cow requires for milk production. The replacement stock—calves and heifers—and the number of bulls required will be about the same in both cases.

With dairying, about half the revenue is expended on labour, whereas with beef the labour should not cost more than £1 per cow per year.

The statement below has been worked out for a 50-cow farm, using the above-mentioned assumptions and valuing dairy produce and beef as shown.

REVENUE FROM THE DAIRY FARM.

	£	s.	d.
Butter Fat—			
12,000 lb. (50 cows producing 240 lb. each) at 1s. 4d. per lb.	800	0	0
Bobby Calves—			
35 sold at 10s. each	17	10	0
Pigs—			
Valuing 24,000 gallons of skim milk at 1d. per gallon ..	100	0	0
Culled Cows—			
8 sold at £7 10s. each ..	60	0	0
Gross Revenue ..	977	10	0
Labour or wages (½ Gross Revenue)	488	15	0
Revenue exceeding labour cost	488	15	0

REVENUE FROM THE BEEF FARM.

	£	s.	d.
Vealers—			
35 sold at £10 each	350	0	0
Culled Cows—			
8 sold at £12 10s. each ..	100	0	0
Gross Revenue ..	450	0	0
Labour or wages (£1 per cow)	50	0	0
Revenue exceeding labour cost	400	0	0

Mr. R. C. Leishman's "Snizort Mossy 4th" and her heifer calf.
[Leader photo.

The above has allowed for an annual loss of two cows and a 90 per cent. drop of living calves. If no stock whatsoever die, and there is a 100 per cent. calf drop, five more bobby calves, and two more culled cows, valued at £17 10s., would be sold from the dairy farm, and five more vealers and two more culled cows, valued at £75, from the beef farm each year.

Dairy farmers who have to reduce their herds are well advised to produce beef as a sideline, rather than sell their dairy stock and re-stock with sheep, because the lack of experience with sheep and the troubles associated with them on dairying country may become serious problems. Good vealers can be produced by using a beef-bred bull on the surplus dairy cows, and the change can frequently be made without the purchase of any additional stock, apart from the bull. This policy has another advantage in that, if it is necessary to revert to dairying, the farmer will be able to build up his herd again more quickly, simply by changing bulls.

There are four main forms of beef production, and each has advantages under certain conditions:—

(1) The production of vealers.
(2) The breeding and fattening of bullocks and heifers.
(3) The breeding of stores for sale as such.
(4) The buying and fattening of stores.

Vealer Production

Vealers are most successfully produced on good country where there is a continuous supply of feed through the greater part of the year. The majority of farms suitable for dairying would produce good vealers. Vealers are usually bred and fattened on the same farm, and, to produce them, good mothers are a necessity. The secret of success with vealer production is to be able to keep them improving all the time until ready for the market. If the calves receive any setback, they will seldom pick up in time to make good vealers.

It is preferable to sell the vealers at four to six months' old, if they are prime, rather than have them go back while being kept until ten or eleven months of age. If the farm pastures or feed supplies are likely to deteriorate through seasonal or other conditions, vealers should be sold immediately beforehand. It is, of course, advisable to grow the vealers

Twenty-month-old steers by Red poll bulls from Jersey-Shorthorn-Friesian cross cows.
[*Farmers' Weekly photo.*

as large as possible. Vealers should be sold off the cow, and, as the mothers should be calving again at the end of the year, vealers must be sold between ten and eleven months' old to enable the mothers to pick up before calving.

Farms producing vealers should be situated in districts where fodder can be cheaply conserved for feeding in the following autumn or winter. The aim of each vealer producer should be to conserve 2 tons of hay, or its equivalent in other fodder, for each breeding cow each year. This quantity should allow for a small surplus to accumulate in normal years for use during drought years, when no surplus fodder is produced for conservation.

Creep feeding of vealers has not developed here. It is an American term for a method of feeding the calves separately from their mothers. A creep is an enclosure with openings through which the calves can enter, but which are too small to allow the cows through. The calves are fed such foods as are necessary in the creep. The cows can be fed outside on roughages and fodders not suitable for young quick-growing calves, as well as on food left by the calves. When necessary, the supplementary rations for the calves should consist of ground grain and good quality cereal chaff, or good quality meadow or lucerne hay.

Vealers may be produced by hand rearing, but the practice is too expensive under Australian conditions, and for this reason hand-reared beef-bred calves are reared in the same way as dairy calves, and, subsequently, fattened as two, three, or four-year-olds on pasture.

Under good conditions, a good mother will produce two vealers satisfactorily.

Breeding and Fattening Bullocks

Where bullocks and heifers are bred, reared, and fattened on the same property, a procedure similar to that for vealer production is adopted. This method of beef production is usually practised on small mixed farms, or on large farms which have rough or poor country and good country combined, the stock being bred and reared on the poor country and fattened on the river flats or other good country. Although it is desirable that, as far as possible, all stock should be bred, reared, and fattened on the one farm, it does not always pay to produce bullocks along these lines, because cattle can be more cheaply bred on rugged country or in low rainfall areas. Where bullocks and heifers are bred, reared, and fattened, the owner has to wait three to five years for his returns. Many owners do not desire to wait so long and find that vealer production, if the farm is suitable, or store cattle production gives quicker turnovers. In the past, on account of the higher price per 100 lb. for veal, vealer production has been more profitable on better class farms.

Breeding Store Cattle

Store cattle production is profitable in the highland areas of Victoria and New South Wales, because the country is not suitable for anything else, and the cost of grazing is very low. Except where the owner has more river

flats and other suitable low country than is required to winter his breeding stock, he is unable to fatten the progeny, and therefore has to sell them as stores.

The production of stores under these conditions is not comparable to the other methods of beef production, and is practicable only on account of the low grazing cost.

Stores reared under these conditions are noted for their hardiness and the way they fatten when brought on to good country. They are, therefore, in demand at store cattle sales. Heifers so reared are used as breeding stock by all classes of beef producers.

Fattening

In southern Victoria many graziers buy store cattle in the late autumn or winter to fatten during the spring and summer for sale the following autumn or winter, when beef is in demand at good prices. The property is re-stocked with stores after the fats are sold. The success of this venture depends largely on the ability of the grazier to buy good stores that will fatten quickly and well. It cannot be recommended to small farmers who live a long way from good store cattle markets, because the buying costs are too high. The fattener also has to make sure that he is not buying cattle that another fattener is re-selling as stores, because they would not fatten.

A fattening bullock requires about as much land as a dairy cow or cow rearing a vealer. A few additional cattle can be fattened, as no replacement stock are required.

There is much scope for improving fattening methods and increasing the efficiency of beef production by pasture improvement and fodder conservation.

The farmer who conserves fodder is able to hold his fats in good condition during periods when others are forced to sell, and then obtain full advantage of the improved prices when beef is scarce. Apart from buying and marketing, and regular inspection, over and above that required for the general maintenance of the farm, cattle fattening requires very little labour.

Vealer Production, Beef Production, and Fattening Compared

The following comparisons are self explanatory, and give a basis for estimating the gross returns that may be expected from a property suitable for fattening, and used for (1) vealer production, (2) breeding and fattening three-year-olds, or (3) fattening store bullocks. Deaths and losses from disease will be greatest where vealers are produced, and smallest where stores are fattened. It is assumed that the property will carry 50 breeding cows, fatten the vealers, and carry all replacement stock.

"Golf Hill Novelty 23rd" and heifer calf, owned by Mrs. J. Biddlecombe.

(1) Vealer Production.

The average number of stock that would be on the property at a particular time would be 50 breeding cows, 45 calves, 1 bull, and 10 heifers for replacing the breeding cows. The annual sales should comprise 35 vealers and 8 culled breeding cows, valued at £450 gross, the price of a vealer being £10 and a culled cow £12 10s.

(2) Breeding and Fattening Three-year-olds.

The comparative number of stock on the property at one particular time would be 25 breeding cows, 23 calves, 1 bull, 22 one to two-year-olds, and 18 two to three-year-olds. Each year 4 of the two-year-old heifers would become breeding cows, leaving only 18 three-year-olds for sale, 11 of which should be bullocks and 7 heifers. There also should be 4 culled breeding cows for sale each year, and the gross returns would be £354, assuming that the following prices were received:—Three-year-old bullocks, £18; three-year-old heifers, £15; culled breeding cows, £12 10s.

(3) Fattening Stores.

The property should fatten 60 store bullocks, valued at £18 per head, on the above basis. As the bullocks have to be purchased as stores, their cost should be deducted before any attempt is made to draw comparisons. If such bullocks cost £12 10s. each as stores, the gross return from the property for the year would be £330.

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
J. L. Fry, Clematis Stud Poultry Farm, 858 Heidelberg-road, Alphington	10.2.43	60
M. A. Jones, Ringwood	22.2.43	352
Reformatory Prison, Castlemaine	3.3.43	299
F. W. Becker, Follett-road, Cheltenham	4.3.43	293
Mrs. C. Penn, Mayfield Poultry Farm, 53 Cromer-road, Beaumaris	15.3.43	527
Ridge and Son, Blackburn	17.3.43	682
Mrs. W. Davidson, Sherbrooke-avenue, Ringwood	24.3.43	103
Anthony Hamilton, "Lyncroft," Flinders	24.3.43	995
John J. King, New Gisborne	24.3.43	48
C. P. Salathiel, Hewitt's Poultry Farm, Skene-street, Bendigo	24.3.43	514
Stanley Wohlers, Box 12, Jung	24.3.43	199
Miss M. T. Gartner, "The Pines," 259 Middleborough-road, Box Hill	2.4.43	119
E. J. Greenshields, Lancefield	2.4.43	221
Alfred E. Hill, 26 Brenbeal-street, Balwyn, E.8	2.4.43	76
H. Mulconry, Callender-road, Noble Park	2.4.43	70
A. Sanders, Boronia-road, Wantirna	2.4.43	367
Frank W. Bentley, Hastings-road, Frankston	6.4.43	592
Mrs. M. A. Godfrey, "The Wattles," Healesville	6.4.43	271
C. W. Henderson, Shepparton East	6.4.43	367
Mrs. M. F. Skinner, Prince's Highway, Noble Park	14.4.43	81
E. Bartlett, Pimpinio	14.4.43	273
A. Counsell, Koomba-road, Wantirna	16.4.43	248
H. Everard, Hawkesdale	16.4.43	382
J. L. Mead, 28 Golf Links-avenue, Oakleigh, S.E.12	16.4.43	81
W. E. Molson, 188 Blackburn-road North, Blackburn	16.4.43	599
K. A. McLaughlin, "Dandevue Poultry Farm," Central-avenue, Bayswater	16.4.43	730
E. G. Vogt, McSwain-street, Mentone, S.11	16.4.43	165

COCCIDIOSIS OF POULTRY

By HAROLD E. ALBISTON, D.V.Sc.,
Director Veterinary Research Institute, University of Melbourne

TO POULTRY KEEPERS.

The Department of Agriculture is anxious to help all owners whose stock may be affected by disease. Unfortunately some poultry keepers appear to be disinclined to report cases of notifiable diseases proclaimed under the Stock Diseases Act, apparently because they fear their operations may be hampered by unnecessary restrictions. This attitude is not justified, as any action taken has as its immediate object the benefit of the individual as well as the industry. Where such outbreaks have been reported promptly to the Chief Veterinary Inspector, the advice given frequently has enabled the owner to avoid the heavy economic loss that would have been incurred had the disease not been speedily diagnosed and properly treated.

Poultry farmers who are experiencing sickness or mortality in their flocks should send a live, sick bird to the Veterinary Research Institute, Story-street, Parkville, N.2, where a diagnosis will be made free of charge. In addition, a letter should be forwarded to the Director of the Institute notifying him of the despatch of the bird and setting out the history of the case.

COCCIDIOSIS is one of the most serious problems with which the poultry farmer is confronted. Not only may the losses sustained through the mortality of chickens be very great, but coccidiosis also may be responsible for deaths among older birds, while the stunting and weakening of survivors of an outbreak of the disease represents a direct financial loss to the poultry farmer.

When the life history of the coccidia is studied, it is readily appreciated that the intensive systems under which poultry are kept in modern establishments actually create the most favourable set of circumstances for the propagation of the parasite.

The ravages of coccidiosis may become very serious when it appears among birds kept in confinement. Under these conditions the disease frequently assumes enzootic proportions. Growing chickens are very susceptible to infection, but as maturity is reached a considerable degree of resistance to the infection is developed. It is only when adult birds become grossly infected or their resistance weakened through some other cause that they suffer from coccidiosis. In fact, mature fowls frequently may be found harbouring coccidia in the alimentary canal without showing any ill effects. Such birds, however, may be considered carriers, and may provide the infective material for a serious outbreak among chickens kept on the same property.

The Parasite and its Life History

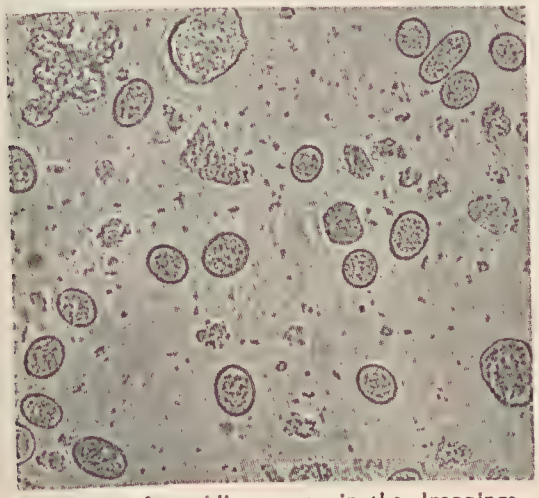
Most of the microscopic organisms associated with the causation of infectious diseases belong to two main classes, namely, bacteria and protozoa. The bacteria represent the lowliest forms of plant life; the protozoa, on the other hand, are generally regarded as the lowest form of animal life. Microscopic in size, they have bodies consisting of a single cell and they frequently exhibit a complicated life cycle or process of reproduction. To this group belong the coccidia which cause the disease known as coccidiosis.

If the droppings of infected birds are examined under the microscope, coccidia are found to be minute bodies with an ovoid or round shape and possessing a thick double shell. These egg-like structures are known as oöcysts, and under favourable conditions outside the body, eight small structures known as sporozoites develop within the shell. This developed oöcyst is the infective stage of the coccidium.

The disease is spread by healthy birds taking in these oöcysts with their food and water contaminated by infective droppings. When the oöcysts reach the intestinal tract, the outer covering splits and the sporozoites are liberated. They are actively motile, and penetrate and destroy the cells lining the mucous membrane of the gut. Each sporozoite entering the cell begins to multiply rapidly, and the progeny invade further cells, so that the destruction of the lining of the bowel may become very extensive. After a certain time this rapid development ceases, and the young coccidia become differentiated into male and female forms. Fertilization takes place, and the result of this sexual conjugation is the production of oöcysts. The oöcysts are cast off from the intestinal

lining, are voided in the droppings, and the life history proceeds again in birds swallowing infective oöcysts.

Although it has been generally believed that the coccidia affecting poultry belong to a single species, investigations have shown that there are several varieties, each producing a different form of the disease. One species causes the common caecal coccidiosis of the chicken, and at least two other species inhabit the intestine, giving rise to intestinal coccidiosis.



Oocysts of coccidia as seen in the droppings.
[Jnl. Am. Vet. Med. Assocn.]

Caecal Coccidiosis

The parasite causing caecal coccidiosis is called *Eimeria tenella.* Infected chickens may show signs of the disease as early as ten days after hatching, although, as a general rule, symptoms are not noticed until the third or fourth week. Resistance to infection increases with age, and birds over three months of age are rarely affected. In young chickens, the disease develops rapidly and the mortality rate is high. In very acute cases, fatal haemorrhage into the caeca occurs as the result of massive destruction of the tissues in these organs. There may be no premonitory symptoms apart from prostration and the passage of blood in the droppings. In less acute cases, the chickens become weakened and dejected with drooping wings, ruffled feathers and a tendency to crowd under the hover as though cold. The droppings may be bloodstained or brownish in colour. Where the infection is not fatal, blood disappears from the droppings, and in some cases recovery is rapid, although a proportion of the survivors fail to thrive satisfactorily.

On postmortem examination of chickens affected with caecal coccidiosis, the caeca or blind gut may be distended with blood. In less acute cases, the caeca are filled with cheesy bloodstained material which tends to adhere to the wall of the bowel, leaving a raw ulcerated surface when removed.

Intestinal Coccidiosis

One form of intestinal coccidiosis, caused by *Eimeria necatrix,* usually appears when the chickens are well grown, from ten weeks of age to maturity. In acute cases, haemorrhage into the intestine may occur, resulting in sudden death without premonitory symptoms. Blood is not observed in the droppings. In less serious cases, the affected birds crowd together for warmth and show unthriftiness and wasting, and a capricious appetite. A post-mortem examination will show either the upper two-thirds of the intestine filled with blood, or when the disease is less severe, greyish-white spots scattered through the substance of the bowel wall.

The other form of intestinal coccidiosis, caused by *Eimeria acervulina,* is chronic in nature, and may effect pullets and adult fowls. The upper half of the small intestine is the site of the infection, and the affected birds show indefinite signs of ill health such as a loss of flesh, pallor of the comb and wattles, leg weakness and drooping of one or both wings. When a bird affected with this form of coccidiosis is opened, the diseased intestine shows transverse whitish masses on the mucous membrane, and in extensive infections the lining of the bowel may be covered by a greyish diphtheritic membrane.

Methods of Transmission

Birds contract the infection by the ingestion of infective material containing developed oöcysts discharged from an infected bird. The origin of outbreaks of coccidiosis may be traced to:—

(1) The rearing of chickens in infected coops or on ground previously contaminated by infected birds.
(2) The transport of young chickens in crates soiled by infective material.
(3) The use of dirty apparatus such as incubators and brooders.
(4) The presence of adult carriers in the flock with the direct infection of young birds running with them, or the transference of infective material by other agencies such as boots and implements from the runs to the chicken houses.

Control

A study of the life history of coccidia shows that control measures must be directed to the prevention of contamination of the ground and food and water supplies with infected material. The sporulation time, that is, the time necessary for the oöcysts in the faeces to reach the stage when they can infect a susceptible bird, varies from 24 to 48 hours. In other words, coccidia in the droppings must be exposed to the air outside the body for this time before they are capable of setting up the disease. As soon as possible after the disease has appeared in chickens, the entire flock should be confined in quarters from which the droppings and litter can be removed every 24 hours for at least a week. A thin layer of litter such as sawdust or shavings, to facilitate drying, and to discourage eating the litter, should be spread over the floors, and removed and replaced daily.

A further precaution and one which has been adopted in battery brooders is the use of raised wire mesh floors in the brooder houses to allow the droppings to fall through to the floor underneath and thus minimize the chance of food and water contamination. Care must be taken, however, to clean and disinfect these wire gratings regularly. Where the floors are constructed with some impervious material such as brick or concrete, efficient disinfection may be accomplished with a painter's blow-lamp.

Boiling water liberally applied will destroy the oöcysts of coccidia quickly, but as they are highly resistant to chemical agents, ordinary disinfectants are not recommended. Earthen runs to which diseased birds have access should be considered highly dangerous, and abandoned for at least a year. Where this is impracticable, the soil should be treated with ground quicklime and ploughed or dug under, or the surface soil removed and replaced by clean earth.

Once the diagnosis of coccidiosis has been established, all obviously sick birds should be killed and their carcasses, together with those

Chick suffering from Coccidiosis.
[From *U.S. Dept. of Agric. Farmers' Bulletin No.* 1652.]

of birds dying from the disease, should be burnt. Infected droppings must be treated with extreme care to prevent the distribution of oöcysts to other parts of the farm and other properties. In fact, where practicable, one person should undertake the management of the infected quarters and have nothing to do with the rest of the poultry farm, and other persons should under no consideration enter the infected pens. Where this is not practicable, the attendant should thoroughly wash his hands and boots before leaving the infected premises; where possible a separate pair of rubber boots which could be soaked in a hypochlorite solution after use should be provided to wear in the infected pens.

Poultry farmers who suspect that their birds are affected with the disease should take or send a live sick bird to the Veterinary Research Institute, Story-street, Parkville, N.2. If the diagnosis of coccidiosis is confirmed, advice as to control and treatment will be given.

Treatment for Greasy Heels in Horses

To treat greasy heels in horses, wash the affected parts thoroughly with warm soapy water to which some lysol or dettol has been added (two tablespoonsful of either to each quart of water). The use of a fairly stiff brush will ensure that the skin is thoroughly cleaned. Dry the skin and hair and then apply a dusting powder made up of equal parts of boracic acid and zinc powder. This is obtainable at any chemist's.

Dust freely on to the affected parts, and cover with a thick layer of cotton wool, and keep in place with a bandage. Renew the dusting powder each day, but do not wash. If rain falls, keep the animal under shelter so that the dressing does not get wet. If the horse has very much hair on the legs, it may be advisable to clip short before starting the treatment. Do not apply oil or grease of any description. Continue the treatment till a cure is effected.

Wheat Varieties in the Wimmera

By B. F. McKEON, B.Agr.Sc., Science Field Officer

THE Wimmera district of Victoria, comprising approximately 13 per cent. of the State, has long been regarded as one of the most fertile and prolific wheatgrowing areas in the Commonwealth. The Wimmera normally produces about 40 per cent. of the Victorian wheat crop, and during the past decade the average annual production in the district was 15,250,000 bushels, representing an average yield of 18·8 bushels per acre, compared with the State average for the same period of 13·6 bushels per acre.

Seasonal Conditions, 1942

Over practically the entire Wimmera, conditions in the past season were very favorable for cereal crops, and yields in the district were the highest for many years. Individual returns exceeding 40 bushels per acre were obtained on many farms.

In a limited area of the western and southern Wimmera, excessively wet conditions during the winter prevented some farmers from completing their cropping programme. A feature of the season was the amount and regular distribution of the rainfall throughout the growing period of the wheat crop. This is set out in Table I, on the next page.

The table shows the monthly rainfall last year compared with the monthly averages at four representative centres in the Wimmera. Crops generally matured under favourable conditions and although some anxiety was felt regarding the possible development of rust, this disease did not develop to any appreciable extent in the crops. On some farms stormy conditions late in the season caused crops to tangle and lodge, but, with the aid of modern harvesting machinery, little grain was lost.

Wheat Variety Trials

Owing to wartime conditions, the cereal experimental work of the Department has been necessarily reduced. However, wheat variety trials were continued in the past season at four centres in the Wimmera—Longerenong College, Nhill, Kaniva, and Charlton. Reflecting the favorable season, high yields were obtained in the tests at the latter three centres, but, unfortunately, at Longerenong a large section of the variety trial was damaged by storms and the yields obtained were not a true indication of the comparative prolificacy of the wheats under test. The average yields obtained at these centres are given in Table II, on the following page.

TABLE I.—MONTHLY RAINFALL (POINTS) 1942 AND MONTHLY AVERAGES AT FOUR WIMMERA CENTRES.

	Nhill.		Horsham.		Warracknabeal.		Donald.	
	1942.	Average 56 years.	1942.	Average 68 years.	1942.	Average 68 years.	1942.	Average 57 years.
January	82	81	93	83	86	74	106	81
February	98	81	68	90	36	85	18	97
March	22	87	27	98	22	87	72	96
April	106	119	166	135	88	111	139	115
May	339	159	343	186	290	163	241	156
June	323	199	250	214	238	176	200	181
July	176	172	190	176	118	152	120	160
August	307	179	293	186	304	160	354	164
September	258	177	276	185	198	161	146	166
October	381	151	296	163	138	140	207	147
November	335	111	306	130	334	110	153	117
December	54	103	64	118	39	95	68	108
Total for Year	24·81	16·19	23·72	17·64	18·91	15·14	18·24	15·88
Total May to November	21·19	11·48	19·54	12·40	16·20	10·62	14·21	10·91

Prominent Wheats in Wimmera Tests

Ghurka has for many years been the most popular wheat grown in the Wimmera and, being familiar to most Victorian wheatgrowers, needs no description. Ghurka continues to yield well in the Wimmera, but in recent years several of the Department's new productions have shown superior yielding ability to that variety.

Foremost among these new wheats is **Quadrat**, produced as a result of crosses made between the four varieties Ghurka, Currawa, Major, and Gallipoli. Quadrat possesses all the desirable field characters of Ghurka and has outyielded that variety in tests throughout the State. Quadrat is recommended by the Victorian Wheat Advisory Committee as a variety suitable for sowing on Wimmera soils.

TABLE II.—WHEAT VARIETY TRIALS IN THE WIMMERA.

Yields in bushels per acre.

Variety.	Longerenong.		Salisbury.			Charlton.			Kaniva.	
	Average 6 years 1936-41.	Average 4 years 1938-41.	1942.	Average 3 years 1940-42.	Average 6 years 1937-42.	1942.	Average 2 years 1941-42.	Average 5 years 1938-42.	1942.	Average 2 years 1941-42
Quadrat	38·4	29·9	49·8	38·1	38·9	38·5	43·5	27·9	50·2	46·4
Magnet	36·8	29·4	53·6	38·3	37·5	35·3	39·4	24·5	50·2	45·5
Ghurka	35·3	28·0	47·6	36·3	36·3	35·6	39·8	26·0	45·0	42·4
Pindar	..	28·5	53·2	37·0	35·9	34·5	38·3	25·5	50·8	..
Baldmin	37·2	29·8	41·8	33·5	34·4	36·6	42·0	28·3	..	..
Regalia	..	..	..	..	..	35·5	39·4	26·8	..	..
Bencubbin	..	..	..	..	..	30·6	37·6	26·5	..	..
New Crossbreds—										
Ghurka x C.M.G. 5537	..	30·4	50·1	38·7	..	38·7	43·8	27·9	53·0	..
Ghurka x White Fife	..	..	44·2	33·6	..	33·3	39·7	..	46·1	46·0
Wannon x Ghurka	38·8	31·8	48·8	35·5	..	37·1	40·8	..	46·8	44·4
Ghurka x Ranee	..	..	..	..	..	40·4	..	..	..	..
Pindar Selection	..	..	58·4	..	..	38·0	..	..	53·1	..
Major x Ranee	36·4	29·9	44·7	35·0	..	..	..	..	..	..

Note.—The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots.

Magnet is a rather different type from Ghurka and Quadrat. It is tall-strawed, late-maturing and possesses a long, tapering, white-chaffed head. Magnet is a heavy grain yielder and in tests at Longerenong has returned high yields of good quality hay also. In some seasons, especially when conditions favour prolific vegetative growth, Magnet has shown a tendency to lodge when sown on heavy Wimmera black land. However, on the mixed and red soils of the district this weakness is not so apparent, and the variety generally stands well.

Baldmin has yielded well in some seasons, particularly at Charlton, where it has given the highest average yields during the past five years. Flour from Baldmin grain is stronger than that from the standard varieties, but the grain is not always well filled. Baldmin straw, on account of its brittle nature, tends to break readily at harvest. The variety is best handled with a header and should be harvested promptly. Baldmin is recommended in the Wimmera for limited sowing.

Other varieties.—The earlier maturing wheats **Regalia, Bencubbin, Ranee 4H,** and **Pindar** which have done well in Mallee tests have not been prominent in tests over a number of seasons in the Wimmera. However, with the difficulties occasioned by shortage of labour at harvest and the necessity for spreading the harvest over a longer period than normal, the advisability of sowing limited areas of one of these earlier-maturing varieties should not be overlooked—particularly in red or mixed paddocks or on the lighter soils of the Mallee fringe section of the northern Wimmera.

TABLE III.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE WIMMERA.

(As estimated by the Government Statist.)

Variety.	Acres, 1941-42.	Percentage, 1941-42.	Percentage, 1940-41.	Percentage, 1939-40.
Ghurka	598,694	63·3	60·4	63·5
Ranee (including 4H)	91,290	9·6	10·2	9·5
Dundee	63,372	6·7	10·5	10·7
Free Gallipoli ..	60,829	6·4	8·0	9·1
Magnet	39,890	4·2	1·0	..
Bencubbin ..	27,524	2·9	3·3	2·0
Bobin	13,884	1·5	1·6	1·0
Regalia	11,554	1·2	0·7	..
Nizam	6,802	0·7	1·1	1·2
Baldmin	4,263	0·5	0·4	0·1
All other ..	28,216	3·0	2·8	2·9
Total ..	946,318	100·0	100·0	100·0

New Crossbreds

For many years the plant breeders of the Department have concentrated on the production of new varieties combining improved flour quality with prolificacy, strength of straw, resistance to disease, and other desirable field characteristics.

Each year a large number of matings of desirable parents is made and the progeny of these are developed in nursery rows at the main experiment stations. These rows are subjected to drastic culling and only those plants exhibiting desirable characters are retained for further selection and testing. This selection work is continued for a number of years until only a few of the more promising true breeding strains of the original population are left. These then pass into the junior replicated plots at the main stations where they undergo their first accurate yield trial. Finally, those crossbreds or selections which exhibit outstanding yielding capacity in the junior tests, pass into the senior yield trials, and are tested in the district experimental plots also. It is evident, therefore, that the production of a single new variety involves many years of careful selection and rigid testing, and for each new crossbred which finally becomes an officially named variety, many hundreds, which may have shown early promise, are discarded.

Prominent among the new productions now under test in the Wimmera district plots are Ghurka x C.M.G. 5537, Ghurka x White Fife—a crossbred with particularly good flour quality—Wannon x Ghurka, Ghurka x Ranee—which has yielded well in the Mallee plots also—and Pindar Selection. Trials with these wheats will be continued over further seasons in order to test their yielding ability against the standard varieties.

The wheats recommended for the Wimmera by the Victorian Wheat Advisory Committee are as follow :—

—	Main Sowing.	Limited Sowing.
Wimmera black land ..	Ghurka Quadrat	Magnet Baldmin
Wimmera red and mixed land	Ghurka	Ranee 4H Quadrat Magnet Dundee Baldmin Bencubbin

BITTER PIT IN GRANNY SMITH APPLES

By G. B. TINDALE, B.Agr.Sc.,* and F. E. HUELIN, B.Sc., Ph.D.†

IN Victoria, the Granny Smith apple is regarded highly and is rapidly becoming one of the leading varieties. It is invaluable for long storage, for it remains crisp and juicy and retains its flavour longer than most varieties. Unfortunately, however, it is very subject to Bitter Pit. This disorder may develop in the orchard and also in Cool Storage, even in fruit which is apparently sound at picking. It is general experience, however, that Storage Pit occurs mainly in apples from orchards where Tree Pit is also serious. Hence it seems reasonable to assume that the incidence of both types of pitting is governed by similar cultural factors, which result in some of the apples becoming pitted on the tree and others being sound at picking but susceptible to the disorder in subsequent storage.

The development of Pit in apples subsequent to picking has rather unfortunate consequences from the export point of view. Apples are frequently picked and packed quite free from Pit and are passed by the Inspectors for export, but they subsequently develop Pit during transport overseas. When the overseas merchants are confronted with pitted apples they pass much adverse criticism concerning growers, shippers, and the inspectors who allow such fruit to be shipped. The development of Bitter Pit in local storage also is responsible for heavy losses to growers.

Bitter Pit, as an orchard disorder, has received much attention by research workers over many years, and it is well known that as the trees reach full bearing and cease vigorous vegetative growth, their susceptibility to tree pitting (and presumably to storage pit) greatly diminishes.

It is generally agreed that the incidence of Storage Pit is greatest in the early, picked apples and that it can be reduced by late picking. In 1938, experiments were commenced to test out this general assumption, and were conducted for four consecutive years with Granny Smith apples, picked at three stages of maturity from an orchard at Croydon. The development of Pit in subsequent storage was recorded. A certain amount of information has now accumulated, and it was thought that a statement on the results would be of general interest.

1938 Experiments

In 1938, three pickings of Granny Smith apples were made on the following dates:—31st March, 14th April, and 28th April. The apples at each

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† Research Officer, Division of Food Preservation and Transport, Council for Scientific and Industrial Research.

picking were quite green, and the hardness of the flesh of the first, second, and third picks as measured by the standard U.S. penetrometer ($\frac{7}{16}$ in. plunger) was 19 lb., 17 lb., and 16 lb., respectively.

Some of the fruit from each picking was cool stored immediately at 34° F., while other samples were delayed at 45°, 55°, 65° F. before cool storage. (These delayed-storage treatments were given because there was evidence that pit development in storage was affected by the length of the delay which usually occurs between picking and storage.)

Each pick was delayed at 45° for 4, 8, 12, 16, 20 and 24 days; at 55° for 3, 6, 9, 12, 15, 18 and 21 days; and at 65° for 2, 4, 6, 8, 10, 12 and 14 days prior to storage at 34° F. The following Table records the percentage of Pit which developed after six months' storage in each pick after the various delayed storage treatments.

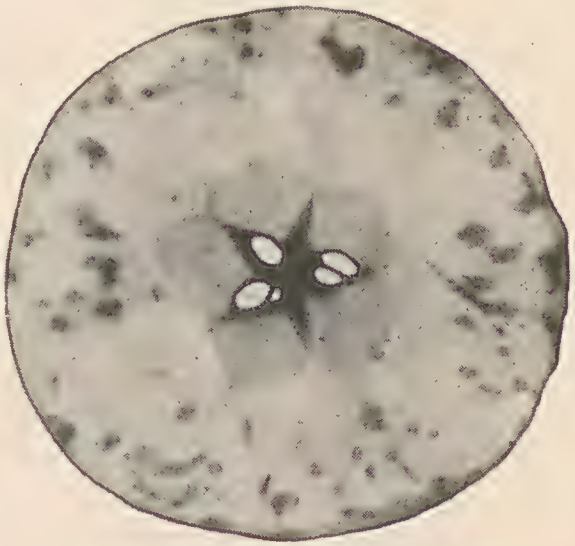
TABLE I.

Delayed Storage Treatment.	Percentage of Pit Developed in Storage at 34°.		
	1st Pick.	2nd Pick.	3rd Pick.
Immediate storage at 34° ..	1	3	0
4 days at 45° then at 34° ..	7	16	0
8 days at 45° then at 34° ..	27	58	0
12 days at 45° then at 34° ..	9	25	0
16 days at 45° then at 34° ..	30	53	0
20 days at 45° then at 34° ..	25	17	0
24 days at 45° then at 34° ..	16	17	0
28 days at 45° then at 34° ..	16	..	..
3 days at 55° then at 34° ..	10	45	0
6 days at 55° then at 34° ..	16	45	0
9 days at 55° then at 34° ..	33	49	0
12 days at 55° then at 34° ..	27	29	0
15 days at 55° then at 34° ..	28	49	0
18 days at 55° then at 34° ..	25	22	0
21 days at 55° then at 34° ..	..	32	0
2 days at 65° then at 34° ..	18	59	0
4 days at 65° then at 34° ..	21	15	0
6 days at 65° then at 34° ..	37	19	0
8 days at 65° then at 34° ..	5	18	0
10 days at 65° then at 34° ..	1	25	0
12 days at 65° then at 34° ..	0	1	0
14 days at 65° then at 34° ..	0	7	0

Discussion of 1938 Results.

In this particular experiment Pit development was comparatively high in the first and second picks and entirely absent from the third pick.

Concerning the effect of storage immediately after picking compared with delayed storage, the results show that in both the first and second picks pit development was almost completely overcome by immediate storage, i.e., in first pick 1 per cent., in second pick 3 per cent. This is in agreement with the results of Smock*, who has shown that immediate cool storage retards the development of Bitter Pit.



Section of an apple affected with Bitter Pit.

Delayed storage at 45° and 55° greatly increased the development of bitter pit in the first and second picks, and the incidence was quite serious right up to the maximum period of delay. Apples delayed at 65° gave a similar result up to about 8–10 days' delay, but a slightly longer period (12–14 days) reduced the incidence of bitter pit to a comparatively low figure, which was approximately the same as that of immediately stored fruit. This result, however, is of no practical value, for long delays at high temperatures prior to storage brought about very serious reduction in storage life. Apples so treated changed from green to yellow at an early date while the flesh changed from crisp to mealy.

1939 Experiments

The 1939 experiments were in the main a repetition of the 1938 experiments, except that the delayed-storage treatments were carried out at one temperature only, i.e., at 60° F. Three

* Smock, R. M. Cornell Agr. Exp. Sta. Mem. 234, 1941.

pickings of Granny Smith apples were made from the same orchard at Croydon. The pickings were made at fortnightly intervals on 5th April, 19th April and 3rd May. The firmness of the flesh of the three picks was 17 lb., 16 lb., and 15 lb. respectively. All three picks were quite green. Each pick was delayed at 60° F. for 3, 6, 9, 12, 15, 18, 21, 24, 27 and 30 days prior to storage at 34° while controls were stored immediately at 34° F. The results of the 1939 experiment were as follows :—

TABLE II.

Delayed Storage Period at 60° F. prior to Storage at 34° F.	Percentage of Pit Developed in Storage at 34° F.					
	1st Pick.		2nd Pick.		3rd Pick.	
	After 3 Months' Storage.	After 5 Months' Storage.	After 3 Months' Storage.	After 5 Months' Storage.	After 3 Months' Storage.	After 5 Months' Storage.
No delay ..	37	58	19	27	0	0
3 days ..	84	85	13	19	2	6
6 days ..	90	91	42	58	47	52
9 days ..	82	82	57	72	70	80
12 days ..	79	81	45	59	52	67
15 days ..	84	86	61	72	60	69
18 days ..	85	87	64	78	66	72
21 days ..	88	90	63	79	74	78
24 days ..	82	82	66	75	62	72
27 days ..	84	84	68	87	75	78
30 days ..	85	86	73	86	70	74

DISCUSSION OF 1939 RESULTS.

After delayed storage, subsequent mean wastage from bitter pit in cool storage was of the order of 70 to 80 per cent. in all pickings. As in 1938, immediate storage had a very profound effect in reducing pit development during storage. Indeed in the third pick there was complete control. In the second pick by immediate storage, pit was reduced to 27 per cent., but it was only partially effective in the first pick, when pit was reduced to 58 per cent. only.

Unlike the 1938 results, however, there was no suggestion that pit liability reached a maximum with increasing delayed storage, followed by reduced susceptibility with further delay. In the above Table, the results of examinations are given after three months' and also after five months' storage. In the first pick all the delayed-storage treatments had reached almost their maximum pit development at the time of the first examination, i.e., after three months' storage, while in the second and third picks there was a slight increase in pit development between the first and second examinations.

The very high percentage of pit which developed in all three picks was probably due to the unprecedented climatic conditions which prevailed throughout the entire growing period. All the spring and summer months up till the end of February were ones of continuous drought, while during January there was a heat wave with record high temperatures up to 113° F. At the end of February the drought broke, after which there were exceptionally heavy rains. The trees from which the apples were obtained were not irrigated throughout the four years of these experiments.

1940 Experiments

The experiments were continued in 1940 on similar lines to the earlier experiments. Three pickings of Granny Smith apples were made from the same orchard at Croydon at fortnightly intervals on 2nd, 16th and 30th April. All three picks were green and the hardness of flesh was 20 lb., 19 lb., 18 lb. respectively. Each picking was subject to delayed-storage treatments as follows :—Delayed at 45°, 55°, 65° and 75° F. for 4, 8, 12, 16, 20, 24 and 28 days and then stored at 34° F., while the controls were stored at 34° without delay. The apples were held in storage for seven months, and were then examined for pit development with the following results :—

TABLE III.

Storage Treatment.	Percentage of Pit Developed during Storage at 34° F.		
	1st Pick.	2nd Pick.	3rd Pick.
Stored immediately at 34	9	0	2
Stored for 4 days at 45° then at 34° ..	18	4	3
Stored for 8 days at 45° then at 34° ..	13	4	5
Stored for 12 days at 45° then at 34° ..	17	5	22
Stored for 16 days at 45° then at 34° ..	10	6	15
Stored for 20 days at 45° then at 34° ..	30	9	9
Stored for 24 days at 45° then at 34° ..	19	5	9
Stored for 28 days at 45° then at 34° ..	13	11	15
Stored continuously at 45°	32	12	28
Stored for 4 days at 55° then at 34° ..	10	1	12
Stored for 8 days at 55° then at 34° ..	9	4	7
Stored for 12 days at 55° then at 34° ..	10	10	14
Stored for 16 days at 55° then at 34° ..	6	8	22
Stored for 20 days at 55° then at 34° ..	22	10	23
Stored for 24 days at 55° then at 34° ..	11	14	9
Stored for 28 days at 55° then at 34° ..	3	3	28
Stored continuously at 55°	3	9	19
Stored for 4 days at 65° then at 34° ..	16	2	3
Stored for 8 days at 65° then at 34° ..	14	5	6
Stored for 12 days at 65° then at 34° ..	9	21	13
Stored for 16 days at 65° then at 34° ..	3	2	6
Stored for 20 days at 65° then at 34° ..	12	4	10
Stored for 24 days at 65° then at 34° ..	3	6	12
Stored for 28 days at 65° then at 34° ..	13	18	14
Stored continuously at 65°	12	8	19
Stored for 4 days at 75° then at 34° ..	9	4	5
Stored for 8 days at 75° then at 34° ..	6	0	3
Stored for 12 days at 75° then at 34° ..	10	4	5
Stored for 16 days at 75° then at 34° ..	19	3	5
Stored for 20 days at 75° then at 34° ..	24	8	7
Stored for 24 days at 75° then at 34° ..	7	24	3
Stored for 28 days at 75° then at 34° ..	14	13	4
Stored continuously at 75°	1	1	3

Discussion of 1940 Results.

First, reference should be made to the extraordinary difference in storage pit development in the two consecutive years 1939 and 1940. As mentioned before, pit development was extremely high in all picks in 1939, whereas in 1940 it was by comparison relatively slight. While the growing conditions for the 1939 crop were possibly the most unfavourable on record, the growing conditions for the 1940 crop were extremely favorable, from which it would seem that a study of the growing conditions, especially water supply, is needed to throw more light on the nature of pit development.

Concerning the effect of maturity on pit development in the 1940 experiment, previous results are confirmed in that both late picking and prompt storage were necessary for control of bitter pit. As in previous experiments, there was definite evidence of considerable control of pit development by prompt storage. Again as in previous results control was complete or almost so in the second and third picks (nil and 2 per cent. respectively), but only partial in the first pick (9 per cent.).

There does not appear to be any significant effect of temperature during delayed storage, but in the samples stored continuously at 34° 45°, 55°, 65°, and 75° for seven months the incidence of bitter pit at 45° was definitely higher than it was at lower or higher temperatures. At 34° and 75° it was generally slight, and very much less than at intermediate temperatures. This result is of fundamental interest only, as the apples at 75° were, of course, quite valueless commercially.

There was no evidence, as appeared in the 1938 results, that with increasing delayed storage, pit development increases to a maximum followed by less pit development with further delay.

1941 Experiments

In 1941 three pickings of Granny Smith apples were again made from the same orchard at Croydon at fortnightly intervals on 3rd and 17th April and 1st May. All three picks were quite green, and the hardness of the flesh was 21 lb., 20 lb. and 19 lb. respectively.

In this year's experiment, the number of delayed-storage treatments was greatly reduced. Each pick was delayed at 60° F. for 1, 2 and 3 weeks prior to storage at 32° F., while the controls were stored promptly at 32°. A coating experiment was also carried in co-operation with Dr. H. S. McKee, Division of Food Preservation and Transport, C.S.I.R., to whom the authors are indebted for permission to quote the results. The apples were coated by dipping in an alcoholic solution containing 10 per cent. of castor oil and five per cent. of shellac, and were stored at 32° after 0, 1, and 2 weeks' delay at 60°. Examinations of the apples were made at monthly intervals in store to determine if pit development progressively increased with increasing storage period, or whether it reached an early maximum. It was found that pit development reached a maximum by July after which there was very little further development.

The following table sets out the amount of pit which had developed at the time of the final examination in November in both the coated and uncoated apples:—

Table IV.

Delayed Storage Treatment at 60° prior to Storage at 32°.	Percentage of Pit Developing in Storage at 32°.					
	1st Pick.		2nd Pick.		3rd Pick.	
	Coated.	Uncoated.	Coated.	Uncoated.	Coated.	Uncoated.
No delay ..	3	33	5	19	0	14
One week	47	80	12	44	7	30
Two weeks	15	59	42	48	12	30
Three weeks	..	58	..	60	..	41

Discussion of 1941 Results.

A. Uncoated Fruit.

As in 1938 and 1939 pit development reached quite high proportions, but unlike the results in the previous years its incidence declined steadily with increasing maturity. There was no suggestion that with increasing delayed storage a peak of pit development was reached, after which pit diminished with further delay.

Concerning immediate storage compared with delayed storage, pit development was greatly reduced by immediate storage to approximately half in all three picks. This reduction was not nearly so great as in former years when almost complete control was obtained in the third pick, by immediate storage.

B. Coated Fruit.

In all instances the coating treatment very considerably reduced pit development, and with immediate storage there was almost complete control. Similar results have been obtained by Smock (loc. cit.).

Summary of Four Years' Results

Effect of Maturity on Pit Development during Storage.

The results have consistently shown that bitter pit can be reduced to a minimum by combining late picking (about the end of April) with immediate cool storage. This treatment almost completely eliminated bitter pit in 1938, 1939, and 1940, but only partially controlled it in 1941. Apart from this result, the relation between maturity and bitter pit was somewhat irregular, and, in apples which had been subjected to delayed storage, bitter pit was generally high in all picks. In 1938 late picking was sufficient by itself to eliminate bitter pit even in delayed fruit, but in 1939, 1940, and 1941 the effect of "delayed" storage was to render late picking practically valueless for the control of the disorder.

Apple affected with Bitter Pit.

Effect of Immediate Storage.

In all four years, immediate storage resulted in great reduction in storage pit compared with delayed storage. In some years there was almost complete control, but not in others. The control was usually much greater in the third pick than in the earlier picks.

Effect of Delayed Storage at Various Temperatures.

There was no sustained evidence that storage-pit development was greater when the apples were delayed, prior to storage, at high temperatures (60°–70°) than when delayed at lower temperatures (40°–50°), although pit may appear earlier at the higher temperatures.

Effect of Delayed Storage for Prolonged Periods.

The evidence over four years indicated that the apples reached maximum pit liability with quite short delays before storage. Further delay had no consistent effect on pit liability. Prolonged delay before storage, however, is definitely harmful by reducing storage life. Before oil wraps were used to overcome superficial scald in Granny Smith apples, prolonged delays before storage were commonly adopted in an effort to overcome that particular disorder. As the practice of delayed storage not only shortens storage life, but renders the apples more susceptible to storage pit, the practice should be discontinued in Victoria.

Effect of Skin Coating on Pit Development.

From the result of a small scale coating experiment, it seems that storage pit development might be greatly reduced by this treatment.

Effect of Growing Conditions on Pit Development in Storage.

In view of the tremendous variation which has occurred from year to year in the amount of pit which developed in storage, it is reasonable to assume that the growing conditions are as important as the factors of maturity and delayed storage, and it is suggested that experiments on the control of the trees' water supply should be conducted.

In the appendix, the monthly rainfall figures are given for the six months' growing period previous to harvest, for each of the four years the apples were obtained. From these figures, it will be seen that the year in which storage pit was so severe (1938–39, when pit development was as high as 70 to 90 per cent.) was marked by continuous drought for nearly five months of the growing period, followed by torrential rains at the end of February.

Appendix

Rainfall figures (in points) at Croydon for the six months' growing season prior to each harvest.

Table V.

Month.	1937–38.	1938–39.	1939–40.	1940–41.
October ..	800	81	260	124
November ..	74	85	580	262
December ..	145	92	119	200
January ..	131	20	201	531
February ..	250	683	96	81
March	206	81	133	254
Total	1,606	1,042	1,389	1,452

[C'wealth Clydesdale Soc. photo.

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

War-time Restrictions

AS a result of necessary war-time restrictions much time and energy are being wasted by many farmers who neglect to order their requirements until the last minute, mainly because they are not familiar with the procedure to be followed in securing those requirements. To avoid delays, farmers must now plan ahead, and lodge orders for essentials only.

Labour.

There is no surplus labour which can be drawn upon at a moment's notice, and farmers requiring additional labour for such seasonal operations as harvesting and shearing should approach the local National Service Officers of the Department of Labour and National Service, give them their exact labour requirements, and a guarantee that they will employ the men supplied for the period stated at award or ruling rates. The farmer must also provide suitable accommodation, otherwise the labour will not be supplied.

The Regional Agricultural Organizers of the Department of Agriculture are assisting farmers to obtain, and the National Service Officers to provide, necessary seasonal labour. During the past season, it has been possible to provide all essential labour requirements for harvesting, shearing, and other seasonal work. In some cases, however, more men could have been employed, and, as a result, harvesting operations were prolonged, but there has been practically no loss of production through failure to secure essential labour.

Some big farming changes have occurred on account of enlistments, and rural workers seeking other more remunerative employment, and this has led to a reduction in the production of some commodities such as dairy produce. Some changes of this nature are inevitable, particularly on farms where conditions of employment do not appear attractive. However, in the dairying industry steps have been taken by the Commonwealth Government to check the drift by increasing the price of butterfat, which will enable the payment of the award rate to employees.

Buildings.

To save manpower and make available more building materials for the fighting and other essential services, a permit has to be secured from the Department of War Organization of Industry before a sum greater than £25 can be spent on the construction or repair of a building. Officers of the Department of Agriculture are assisting both farmers and the Department of War Organization of Industry by recommending the issue of permits for the erection of essential new buildings, or the making of necessary repairs.

Fencing Wire.

On account of the large demand for zinc in the manufacture of munitions, galvanized fencing wire can no longer be produced, and only black plain and black barbed wire and black wirenetting are now available. The quantities available are below requirements, and the Department of Agriculture is sponsoring the release of wire to farmers in accord with the essentiality of their produce. In this regard

it will be necessary for farmers to state the branch of agriculture for which the wire is to be used, and also whether it is for new fencing or repairs to existing fences. Farmers should order requirements from their usual supplier and then forward the following information to the Director, Department of Agriculture, Melbourne, C.2:—Name and address of farmer requiring wire, the quantity, gauge and type of wire required, the purpose for which required, the kind of crop or livestock produced, the name and address of the retailer with whom the order was lodged, and the name and address of wholesaler supplying the retailer. The following is a list of the various types and gauges of wire which are being released by the Commonwealth Directorate of Materials Supply:—

Barbed wire (12½ gauge, cwt. coils).

Plain wire (10 gauge, cwt. coils).

Plain wire (12½ gauge H.T., cwt. coils).

Wirenetting (12 in. x 1½ in. x 17 in., 100-yd. rolls).

Wirenetting (42 in. x 1½ in. x 17 in., 100-yd. rolls).

Wirenetting (72 in. x 2 in. x 17 in., 100-yd. rolls).

Pig fencing, Ringlock high tensile (8 wire x 30 in., 110-yd. rolls), for pig producers only.

Dairy Cows

A large amount of work is saved when cows can be efficiently machine-milked without stripping. In the last annual report of the New Zealand Dairy Board, it is reported that a careful examination was made of a number of dairy herds in which stripping had not been practised for periods of up to 25 years. The investigations indicated that, provided the milking machine is kept in good condition and reasonable care is exercised in milking the cows, the abandonment of stripping does not result in any significant decline in production, or increase in mastitis. If non-stripping is contemplated, it is advisable to start at the beginning of a cow's lactation. The milk flow should be "started" as, or immediately before the machines are put on, and the udder should be felt to make sure that it has been milked out before the machines are removed.

In the above-mentioned report, the Animal Research Division of the Board also states that during the past two years it has been shown that much of the unthriftiness in calves which occurs when they are grazed in the usual calf paddock can be avoided by rotating the calves in the cow paddocks ahead of the cows.

Winter Feeding of Pigs

A Substitute for Milk.

When separated milk is not available for pig feeding, meatmeal may be substituted, and, when fed at the rate of ¼ lb. per pig daily to pigs from weaner to baconer stage in combination with grain and either pasture, green food, or lucerne chaff, good results can be obtained.

Dry sows require ¼ lb. meatmeal daily, while sows suckling litters require up to 1 lb. daily in the absence of separated milk.

Meatmeal is obtainable from most produce stores in bags ranging from 50 lb. to 140 lb. at a cost of less than 1½d. per lb.

When used at the rates quoted above, the cost of meatmeal is not a limiting factor in pig production. It is known that in the absence of separated milk or meatmeal, pigs grow much more slowly and require much more grain for each pound of pork produced, and breeding sows produce smaller and weaker litters and do not milk so well. Meatmeal is, therefore, a good investment when fed sparingly with grain during the period of milk shortage on dairy farms.

When there is little or no milk available, pigs should have access to a trough containing a mixture of 3 parts ground limestone, and 1 part salt.

The quantity of grain to feed should be determined by the appetite and condition of the pigs.

[L. A. Downey, H.D.A., Pig Expert.]

Sheep

Flock owners should consider sire replacement for the coming season. As soon as working sires have had time to make up, they should be classed, and arrangements made for any replacements. Many sheep owners do not pay sufficient attention to ram classing. Irrespective of age, the owner will always find an odd sheep falling back, and these are the sheep that should be discarded.

The amended shearing regulations, providing for the zoning of shearing for the coming season, were issued early last month. Under the new regulations the shearing of lambs under six months is exempt from zoning, and shearing of these will now be permitted at any time convenient to the owner, and although owners

of fewer than 1,000 sheep, excluding lambs not six months' old, will be permitted to shear at any time, they must report their shearing dates to the Director-General of Manpower if they shear during the prohibited periods.

[N. A. Bowman, Sheep and Wool Expert.]

Horses

With the approach of winter, arrangements to have all working horses clipped and rugged should be attended to immediately.

When horses are doing regular heavy work, they will do much better if their bodies are clipped, although it is preferable to leave the legs unclipped. When work is finished for the day, clipped horses should be rubbed dry and then rugged.

With colder weather, it will be found necessary to increase the rations, as more food is consumed in maintaining body temperature. During the winter months, the addition of two tablespoonfuls of carron oil in the feed three times a day is beneficial. Carron oil can be prepared on the farm by mixing thoroughly equal parts of lime water and raw linseed oil.

When horses are stabled, a feed of hay at night is recommended.

All horses should have their teeth attended to at least once a year. Horses at grass, and unshod, require to have their hoofs attended to at frequent intervals, while if the pastures are poor, daily feeding of hay in racks is beneficial.

Stallion owners are reminded that under the provisions of the Horse Breeding Act applications for registration, accompanied by the necessary fees, must reach the Chief Veterinary Inspector by June 30th.

Owners of two-year-old colts who desire to use them for service in the coming season must apply for registration by June 30th, the fee for the registration of a colt being £1.

All those who intend to have colts or stallions inspected in the coming season are advised that each animal must be well groomed and thoroughly handled to facilitate the work of the examining veterinary officer. Unhandled stallions should be brought in and handled immediately.

[W. D. Shiew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Poultry Notes

The breeding season will commence in June or July. The best birds should be retained as breeders; they should be well looked after and fed liberally with standard rations of good quality. All eggs retained for hatching should be carefully selected for size, shape, and texture of the shell.

In the setting up of a poultry farm as a sole means of livelihood, not less than 5 acres of well-drained land should be procured. This area should include sufficient suitable land to grow enough green food for up to 2,500 birds. The farm should be built up gradually while the necessary experience is gained. The best

Stud Hereford bulls bred by Mr. J. H. White, "Timor," Blandford, N.S.W.

birds should be purchased for the purpose of building up the farm, otherwise failure may result through high mortality and low egg production. The best way to commence is to purchase day-old chicks or, perhaps, partly-grown pullets, during the months of July, August, and September, from successful poultry farmers.

The houses built for the laying birds should be high, properly ventilated, free from draughts, and rainproof, and the floor high and dry. A concrete floor is recommended. The floor should be covered with clean straw, which should be replaced every three months. To avoid overcrowding, four square feet of floor space should be allowed for each bird.

It is essential that the birds be given sufficient food of good quality. During the laying period each bird consumes approximately 2 oz. of mash and 2 oz. of grain per day. For egg production the birds should be given as much as they will eat. There should be a sufficient variety of foods to make sure that they will consume a regular amount, and to maintain good health. It is also necessary to feed not less than 5 to 6 lb. of chaffed tender green food to every 100 adult birds daily. Shell grit, and also a liberal supply of pure cool drinking water should be kept continually before the birds.

The houses must be kept clean, and the perches should be regularly treated with a disinfectant, such as crude oil, tar oil, &c., in order to prevent the introduction of red mite. These measures are very important considerations if the good health of the birds is to be maintained.

[H. F. Clinton, Poultry Expert.]

Bees

Preparations should now be made to winter down colonies. It is advisable to make a compact brood-nest, and remove surplus supers not required by the bees. Ample stores should be provided; about 40 lb. of honey is sufficient if the colony is strong, and no food is forthcoming before the spring.

Colonies wintered in single hives should not be allowed more honey than the bees will cover, otherwise fermentation of honey or robbing by bees from stronger colonies may result. It is advisable to keep such colonies under observation during the early spring and, should they run short of stores, assist them by feeding.

Any queenless colonies can be united to normal or "queenright" colonies of equal strength. A good method of uniting is to place a sheet of newspaper over the normal colony, and, at dusk when the bees have finished flying, place the queenless colony in a super on top of the hive containing a queen. The bees will gnaw through the paper, and unite quietly.

If colonies require feeding to carry them over the winter, combs of honey can be given, but if these are not available, they can be fed from an inverted or friction top feeder, which can be made from a 7-lb. honey or treacle tin. About two dozen holes are punched in the lid, the feeder filled with honey or sugar syrup, and then inverted over the cluster, inside an empty hive body. Packing should be placed around the feeder to conserve warmth, and to prevent the upward heat escaping from the colony below.

Extracting equipment before being stored away should be thoroughly washed with boiling water, and thoroughly dried. Any residue of honey left over winter on the extracting baskets causes discoloration and rusting, which is extremely hard to remove.

Surplus dry combs removed from the colonies can be tiered up in supers in the open, or given shed protection, and made mouse-proof.

Any danger from wax-moth can be overcome by making the tiers of supers reasonably air-tight and placing an empty hive body on top of the stack, inside of which is placed a tin containing about three fluid oz. of bisulphide of carbon.

Place a cover and bag mat over all tiers with a fairly heavy weight on top. If more carbon bisulphide is added every two months, the combs will be kept free of moths and vermin.

Avoid using bisulphide of carbon in a closed building or near a light, as it is inflammable.

[W. A. Collins, Apiary Inspector.]

Bees Acts.—New Regulation.

A Regulation under the Bees Acts was gazetted on the 1st March last, which provides that after the 1st June, 1943, the owner of any beehives shall legibly mark such beehives with his name and permanent address, in plain letters not less than three-quarters of an inch in height.

The new Regulation will not apply to any hives kept at the permanent address of the owner, and for the purposes of the Regulation "owner" includes "lessee."

This Regulation has been made with a view to facilitating the administration of the Bees Act, particularly in regard to the immediate identification of any hive in which disease has been detected by apiary inspectors.

SUSPECTED PLANT POISONING IN STOCK

By G. NICOL, B.V.Sc., Veterinary Officer

UNDER drought or poor fodder conditions or abnormally good growing conditions, stock will often eat plants which otherwise would be unattractive to them; likewise, when stock are depastured on agistment country, they will often eat shrubs and plants which local stock will not eat; again, under conditions of excessive thirst or hunger, or after travelling considerable distances, or where there is a depraved appetite, poisoning may occur. Mouldy feeding stuffs or hay made on poor country containing poison plants also may be a source of trouble.

Symptoms

Symptoms associated with plant poisoning often vary a great deal, and may be confused with symptoms resulting from other conditions.

Where plant poisoning is suspected there should be no delay in forwarding specimens for botanical examination; toxicity of plants varies with the climate, season, soil and more particularly stage of growth, so that feeding experiments with a plant known to be poisonous often yield negative results. This is often because the plants have passed the poisonous stage; in Rosewood (*Heterodendron oleaefolium*) for example, the young, actively growing leaves are more poisonous than the mature leaves; the poison of Stagger Weed (*Stachys arvensis*) is confined mainly to the seeds.

St. John's Wort (*Hypericum perforatum*), Burr Medick (*Medicago denticulata*) and Panicum effusum are often responsible for a condition known as photo-sensitization, in which there is an inflammation of the skin of various unpigmented areas, these areas being discoloured, with loss of hair and scab formation.

Disturbances of gait occur when some plants, including the Small-flowered Mallow (*Malva parviflora*), Wild Parsnip (*Didiscus glaucifolius*) are eaten.

Some symptoms occur only when animals are forced to take exercise, while sometimes animals in certain paddocks only are affected. In some cases death occurs rapidly, in others there is an acute gastro-enteritis, while sometimes nervous symptoms are developed.

One example will be given of the necessity for supplying full details of the history of the case: diarrhoea occurs where there is gastro-enteritis present; submission of suspected plants plus a history of diarrhoea is not sufficient on which to base a diagnosis; the cause of the diarrhoea may be arsenic or other metallic poisoning, a bacterial infection, a parasitic infestation as so often occurs with the small hair worm and with coccidiosis; it may be Johne's Disease in cattle, or again, a paratyphoid infection or due to faulty and unhygienic feeding of calves. Even if the plant submitted is one which on occasions has been responsible for deaths in stock, it does not follow that the plant is the cause of death in the particular case.

Submission of Specimens

Where specimens are being submitted, there should be included particulars of the class of stock and the number affected, all symptoms noted, the number of deaths, history of any previous cases, treatment given, if any, and the measures taken to prevent further losses. Particulars of symptoms should include whether death was rapid or not, whether peeling of skin, jaundice, diarrhoea, or abnormality of gait were noted. In addition to sending suspected plants (addressed to the Chief Veterinary Inspector, Melbourne, C.2), it is always advisable, if possible, to give particulars of the district, soil, pastures, and flora existing on the property, even if this should include many plants not suspected of being poisonous.

Prevention

Where deaths have occurred, measures to avoid further deaths are important. Transfer of stock to other paddocks is often useful in that the poisonous plants may not be growing in such profusion there. Allow access to pastures in the least dangerous stage, e.g., Hedgehog grass (*Echinopogon ovatus*) is non-toxic as soon as the seed head has formed, while paspalum and rye grass are not likely to cause trouble due to ergot poisoning if fed before the plants seed.

Watering of stock before turning on to certain pastures, particularly where grazing over stubble, is good practice as animals are not then tempted to satisfy their thirst on all succulent plants.

A survey of the botanical constituents of a property before any trouble occurs means that the owner is aware of the plants which may be a source of trouble to himself.

Plants containing cyanide can be detected by application of the sodium picrate test which depends on the reddening of prepared paper strips when in the presence of prussic acid. Additional feeding before turning on to such plants as sorghum is useful. Where animals have, for any reason, been starved for any length of time, avoid turning loose on to plants that may be poisonous at certain stages.

Treatment

Treatment to be of any use, usually depends on an early diagnosis. With prussic acid poisoning (species responsible include Sorghum and Sudan grass hybrids, and many other plants), an injection intravenously of the following solution is necessary:—

	Cattle.	Sheep.
Sodium nitrite	3 gm.	1 gm.
Sod. thiosulphate	15 gm.	2·4 gm.
Water	20 ml.	10 ml.

For oxalate poisoning (species responsible include soursobs—*Oxalis cernua*) calcium salts are often successful while for nitrite poisoning methylene blue used in a 0·6 per cent. solution in normal saline is a specific. The use of the above, plus also the use of stimulants as caffeine, strychnine, or of narcotics are essentially the province of the veterinary surgeon.

Where jaundice and peeling of skin have occurred, it is necessary to shade the animals until they recover. In addition, if a small number only is affected, smearing of white areas (that is where there is no pigmented skin) with lard containing soot is useful as a temporary measure.

Where a large number of animals is affected they should be rested in a sheltered paddock with a good water supply. To prevent further absorption of poison, a dose of tannic acid or of strong tea (which contains tannin) is probably the best treatment.

Selection of Eggs for Incubation

All poultry keepers should aim at producing only the best quality eggs. The quality of an egg is determined not only by its internal quality, but by its external features such as size, shape, and shell texture.

Pullets hatched from poor quality eggs are likely to lay eggs of the same standard, therefore it is advisable to hatch only from the very best. The ideal egg for incubation should weigh not less than 2 oz., should be of good egg shape not too round nor too long, with a good quality shell, free from ridges or roughness.

Fresh eggs hatch better than stale ones. Although instances are on record of chicks being hatched from eggs several weeks old, it is advisable not to hold eggs that are intended for incubation for longer than about ten days. Extreme temperatures affect hatchability, therefore eggs should be held at moderate temperatures. A temperature between 55 and 65 deg. F. is considered ideal.

Eggs for the incubator should be gathered regularly several times a day. This prevents them being cracked, keeps them cleaner, and guards against exposure to bad weather.

It is preferable to clean the eggs rather than to incubate dirty ones, but if possible cleaning or washing should be avoided as it may effect fertility.

To summarize—eggs for incubation should be clean, fresh, not less than 2 oz. in weight, and of good shape and shell texture. If eggs of this standard are used for incubation, hatching results will be very much improved.

Marketing of Potatoes in Victoria

Review of Seasons 1941 to 1943

By the Hon. E. J. HOGAN, M.L.A., Minister of Agriculture

IN 1941 a bountiful crop of potatoes was produced in Victoria. The yield was 250,000 tons, compared with an average yield, during the previous five years, of 140,000 tons.

The consumption of potatoes in Victoria was about 120,000 tons per year. Normally 20,000 tons were exported to other States. Therefore, in 1941, there was a surplus over normal consumption of 110,000 tons of potatoes, which could not be sold and which being perishable, could not be kept until the next season. In the over supplied market, the problem facing growers was how to obtain a payable price for the portion of their crop which could be sold. If growers continued to send their potatoes to the glutted open market without regulating quantities, prices would fall below the cost of production. This actually happened in June and July of 1941, when potatoes were sold for 25s. per ton at country railway stations. Second-hand bags cost 8s. per dozen (fifteen bags are required to hold a ton of potatoes); cartage from the farm to rail station cost 3s. per ton; digging 15s. to 30s. per ton; selling commission, 5 per cent. In addition to these charges the cost of production, including seed (½ ton per acre) and superphosphate two to ten cwt. per acre had to be borne by the farmer.

It was obvious that growers would suffer serious loss unless something was done to regulate the supply to the market and increase the price ruling on the open market.

A conference of Victorian, New South Wales, and Tasmanian growers presided over by the Commonwealth Prices Commissioner (Professor Copland) agreed to a stabilization plan for New South Wales, Victoria, and Tasmania. But Tasmania failed to implement the plan and the interstate plan had to be abandoned. At the request of Victorian growers, the Victorian Government then agreed to institute a stabilization plan for this State only.

As all of the 250,000 tons of potatoes could not be sold that year even at a very low price, the objective was to fix a reasonable price for the No. 1 grade potatoes, which could be sold for human consumption in Victoria, and secure a better price for the potatoes exported to other States.

Under the National Security (Emergency Powers) Acts, draft regulations were prepared by the Department of Agriculture and submitted to the Victorian War Advisory Council, consisting of the Premier (Mr. Dunstan), the Minister of Lands (Mr. Lind), the Minister of Education (Sir John Harris), Messrs. Hollway, Maltby, and Macfarlan—representing the United Australia party; Messrs. Cain and Cremean—representing the Labour Party; and Mr. Eager—representing the Legislative Council. The War Advisory Council agreed to the Regulations, and they were gazetted on the 29th of July, 1941.

A committee consisting of J. W. Ward (representing the Department of Agriculture; W. W. Chapman and A. C. Boustead (representing potato growers); J. F. Noonan and H. G. Tinney (representing potato merchants); and E. K. Ahern (representing consumers of potatoes) was appointed to administer the stabilization plan.

The Commonwealth Prices Commissioner had no authority to fix a minimum price, but he issued an Order fixing the maximum price of potatoes sold for human consumption in Victoria, and to which was affixed the seal of the Director of Agriculture, at £6 per ton in Melbourne for No. 1 grade potatoes (later raised to £6 10s. per ton). To maintain the maximum price, the Victorian Potato Committee regulated the supply to meet the demand which was about 2,000 tons per week, and quotas were allotted to growers based on 40 per cent. of the No. 1 grade potatoes unsold on the 21st of July, 1941; unrestricted sales of potatoes for interstate and overseas trade, for seed, or for processing purposes was permitted.

The Committee was not a Marketing Board, and it did not acquire or sell potatoes. It regulated the quantity placed on the market, and the growers sold their quota any way they chose.

Under the plan, growers received an average price of £5 per ton at country railway stations for sealed potatoes instead of the 25s. to 35s. per ton they were selling potatoes for prior to the plan coming into operation.

Under the plan 30,600 tons of potatoes were sold in four months in 1941 at £5 per ton at country centres. 32,522 tons of potatoes were

shipped to other States compared with an average of 20,307 tons per year shipped over the previous five years; 4,212 tons were shipped overseas compared with an average of 527 tons per year shipped oversea for the previous five years.

1942

Owing to drought conditions in New South Wales and Queensland, it became clear in the early part of 1942 that the potato crop in Australia would be very light that year. The yield from early crops was poor and (in order to make available for consumption all wholesome potatoes) the closing date for the sale of potatoes conforming to the "new" potato grade was extended by the Department of Agriculture to the 31st May, and permission was granted to sell No. 2 and No. 3 grade potatoes for human consumption.

In March, 1942, a Conference in Sydney was attended by a representative of each State and of the Department of Supply and Development, the Department of Commerce and Lt.-Col. Sir C. Stanton Hicks, Chief Inspector of Army catering, who said that the Army required 220 tons of potatoes a day, about 80,000 tons per annum. The estimated production that year in Australia was 298,000 tons. When the report of this Conference was under consideration in March, the population of Australia had increased considerably by Allied troops and prisoners of war, and was expected to be further increased by Allied troops, and the A.I.F. returning from the Middle East.

On the 21st April, 1942, *the Commonwealth Government decided to control the production and distribution of potatoes* and appointed The Australian Potato Committee. It consisted of the Secretary of the Commerce Department, Mr. J. F. Murphy; Controller of Defence Foodstuffs, Mr. G. A. Davis; Department of War Organization of Industry, Dr. E. R. Walker; Acting Prices Commissioner, Mr. M. E. McCarthy; Executive Officer and Potato Controller, Mr. A. C. Foster.

A Deputy Controller for each State was appointed, and a Potato Advisory Committee was appointed in each State.

The Victorian Potato Advisory Committee consists of:—Mr. J. Brake, Superintendent of Agriculture, Chairman; Mr. J. P. Morrissey, J.P., grower, Western District, and Mr. W. Chapman, grower, Gordon, Bungaree, nominated by Victorian Potato Growers' Association; Mr. A. C. Boustead, grower, Dean; Mr. A. W. Giles, grower, Gippsland; Mr. H. Tinney, representing country merchants; Mr. J. Downey, representing city merchants; Mr. H. Andrew, Potato Purchaser for Army; Mr. H. J. Book, Emergency Foodstuffs Committee; Mr. Todd, representing Prices Commission. Mr. H. O'Brien was appointed *Deputy Potato Controller* for Victoria.

The Prices Commissioner fixed a maximum price of £16 17s. 6d. per ton, Melbourne.

Mr. Tinney was appointed to act as a Wholesale Distribution Manager, and he arranged for the distribution of all potatoes marketed under direction of the Deputy Potato Controller, who advised him of the quantities required for the Defence Services, for canning and dehydration, for exports to other States, and the quantities to be sent to the country and metropolitan areas for the civil population.

1943

To ensure adequate supplies of potatoes in 1943, growers were asked to increase the acreage planted, with potatoes by 50 per cent. A minimum price of £8–£10 was guaranteed by the Commonwealth Government, the farmer to receive the market price if it exceeded the guaranteed minimum price.

As Minister of Agriculture, I conducted a campaign to increase the acreage planted with potatoes and Victorian farmers planted 55,000 acres with potatoes for the 1943 season, which is 20,000 acres more than for the 1942 season. This increased acreage required 10,000 tons of seed and a great deal more work by the growers.

In a bad season, this acreage might be insufficient to provide enough potatoes for all requirements, but if it is a good season the market might be glutted at certain times. This should be guarded against by the erection and operation of dehydration plants in the Ballarat and Dandenong districts. The Commerce Department of the Commonwealth undertook to erect and equip these plants in time to work this season.

The Executive of the Potato Growers' Association organized the various meetings of growers, which considered and approved of the action to stabilize the marketing and obtain a better price for their product than was obtainable in the open market. The Hon. Secretary of the Association, Mr. Chapman, and Mr. Boustead, Mr. Giles, and Mr. Morrissey, have been very helpful, and I am grateful to them and to the other members of the Executive, and to the branches of the Association for their advice and assistance to stabilize the market and obtain a payable price for the potato growers.

Registration of Stallions

Twenty-third Annual Report

By R. J. deC. TALBOT, B.V.Sc., Chief Veterinary Inspector

ALTHOUGH the number of stallions examined and the total registrations for the year 1942-43 are slightly lower than for the previous year, the percentage of rejections both for unsoundness and type and conformation were the lowest since the Horse Breeding Act came into operation in 1919, and must be considered satisfactory. Of the 180 stallions examined, only 3.4 per cent. were refused registration because they were unsound, and 7.7 per cent. were rejected because they were below a reasonable standard of type and conformation.

Since the outbreak of war there has been a large increase in the number of horses being used for draught purposes, both in Melbourne and provincial centres. The quality of horse teams seen in the metropolitan area is, generally speaking, excellent, and is probably not better in any part of the world. This reflects the greatest credit on Victorian breeders, and must be due in no small measure to the operations of the Horse Breeding Act over the last 23 years.

As was stated in last year's report, horse-breeding has slumped since 1937, but during the past twelve months there has been a steady improvement in the demand for all types of horses, and a recent horse sale at Wodonga was the largest and most successful held for many years.

The writer agrees entirely with the views expressed at the Annual Meeting of the Victorian Branch of the Commonwealth Clydesdale Horse Society when the President stated that he felt confident that horses would be used much more extensively in the future, and that an improved demand would stimulate greater interest in stud breeding.

By the use of horses rather than tractors, the war effort is being materially assisted, and as the demand for horses will undoubtedly increase, farmers are advised to breed some foals each year.

Bonus for Foals

With a view to encouraging the breeding of the right type of draught horse, the Government has decided that a bonus of £2 will be paid to the owners of every foal the progeny of a registered draught stallion and a mare approved by the Chief Veterinary Inspector. For the year 1941-42, the bonus was paid in respect of 1,500 foals.

For this year over 1,000 applications have been received, and intending applicants are reminded that all applications must reach this office before 30th June next.

The Bonus Scheme should, undoubtedly, act as a stimulus to draught horse breeding.

During the year under review, the total number of stallions registered was 933, comprising 567 draughts, 202 light stallions, and 164 pony stallions. Although these figures appear low when compared with those for the period 1934 to 1938, they are higher than the registrations effected during the period 1927 to 1932.

Examination of Mares

Breeders are reminded that, under a voluntary scheme, stud book mares may be submitted for examination for soundness. A fee of £1 is charged for the examination, and certificates of soundness are issued for three-year-olds and four-year-olds, and life certificates for mares five years and over. In the past, many owners have availed themselves of the opportunity of having their mares examined, and it is hoped that during the coming season all stud breeders will present at least some of their mares for examination.

Two-Year-Old Colts

In 1939 the Horse Breeding Act was amended to provide for the registration of two-year-old colts whose owners desired to give them some stud service. The amendment provides that owners must make application for registration on the prescribed form, and the application must be accompanied by a fee of £1. The colt must be submitted for examination at a scheduled parade, and, if passed, will be registered

LIST OF UNREGISTERED STALLIONS RETAINED BY OWNERS FOR USE WITH THEIR OWN MARES.

Under the provisions of the Horse Breeding Act the owner of any stallion, the registration of which has been refused, may, on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for breeding purposes with his own mares only.

Name.	*Age and Class.	Owner and Address.
Unnamed	A. L.	M. Cole, Kooreh
Alto Bells	A. P.	J. Barty, Redesdale
Baron Bold	A. D.	Mrs. D. E. Daly, P.B., Detpa
Bell Boy	A. T.	A. G. Turnbull, Coleraine
Benambra	A. D.	Nankervis Bros., Corryong
Ben Bowyang	A. D.	S. J. Wilson, Nar Nar Goon
Black Baron	A. D.	A. E. Tucker, St. Arnaud
Black Prince	5 P.	W. K. Thomas, Mt. Cole Creek
Black Star	A. L.	D. Madill, Koyuga South
Bowler	A. D.	A. C. Masters, Corryong
Bravia	A. T.	E. J. Wright, Flynn
Clan MacKenzie	A. D.	J. Purdie, Wunghnu
Clyde	A. D.	Geo. Thomson, Kilcunda
Danny Bell	A. L.	H. Spice, Bacchus Marsh
Danny Boy	A. L.	W. Meagher, Danyo
Devon Point	3 L.	J. Manifold, Weerite
Drummer	A. D.	F. Bird, junr., Yarram
Ethalldale Scotson	A. D.	H. T. Kramer, Lawloit
Fifeness Flash Baron	A. D.	H. L. Treasure, Stratford
Flash	5 P.	A. F. Sanders, Sale
Glen McBride	A. D.	H. Jager, Swan Hill
Haboob	A. P.	J. E. D. Crozier, Casterton
John McElwyn	A. P.	D. Bamford, Beeac
Kawaran Liston Craig	A. D.	V. O. Frost, Netherby
Keayang	A. D.	Jas. Blain, Dixie
Lee Wah	4 L.	Mrs. M. J. Forster, Pyramid
Lord Victor	A. D.	J. Montgomery, Milawa
Majestic Knight	A. P.	Miss G. Small, Fern Tree Gully
Mallee King	A. D.	S. R. Pearce, Woomelang
Manya Thrill	5 L.	E. Wheeler, Manya North
Model	A. D.	G. B. Wilson, Timboon
Money King	5 L.	J. A. Bowland, Leitchville
Naseby Benedict	3 D.	C. Hewitt and Sons, Warracknabeal
Noble	A. D.	E. Crowe, Tatong
On Time	A. T.	E. O. Bidstrup, Broadford
Peter	5 D.	C. A. Deckert, Boinka
Pettadales Pride	A. D.	D. Green, Junr., Nullawil
Pride	5 D.	T. J. Chamberlain, Arnold
Prince	A. D.	F. Justin, Camperdown
Prince	A. D.	A. H. Fawson, Bairnsdale
Prince	A. D.	R. Estoppey, Briagolong
Professor	A. P.	Exors. C. L. Forrest, Irrewarre
Punch	A. D.	J. Sansom, Bayles
Puhch	A. D.	W. Earl, Woodside
Pyjamas	A. P.	Boyd Bros., Koroit
Rob Roy	A. P.	Miss E. A. Small, Hawthorn
Royal King	A. D.	D. Gorman, Crossley
Royal Prince	A. D.	J. H. Crawford, Victoria Valley
Sailor	A. D.	A. G. Turnbull, Tyrendarra
Sam	A. D.	A. G. Turnbull, Tyrendarra
Scotland's Duke	A. D.	H. F. Quick, Box 19, Brim
Sir Michael	A. D.	E. Lewis, Tatong
Sordino	A. T.	L. Mathews, Benambra
Stormy	A. P.	Mrs. L. G. Canning, Mildura
Sunset Trail	A. T.	Yarraberb Pty. Ltd., Raywood
Surprise Power	A. P.	W. T. Jensen, Morwell
Waldaira's King Knight	A. D.	Boyd Bros., Koroit
Warrangee Oswald	A. D.	Geo. Lord, Eskdale
Wee McGregor	A. P.	J. H. Waugh, Seymour
Winton Victory	3 D.	S. V. Sewell, Berwick
Worawingeth Allenby	A. D.	W. T. Rowe, Wallinduc
Young Harold	A. P.	W. J. Newton, Bridgewater
Young Toby	A. D.	W. J. Newton, Bridgewater

* NOTE.—Age in years. A., aged; D., draught; L., light; P., pony; T., thoroughbred.

as a colt for one year. During the season 1942-43, thirteen colts were submitted for examination, eleven passed and were registered, and two were rejected because they were below a reasonable standard of type and conformation.

Appeals

No appeals were lodged against the decisions of the examining veterinary officers for the season under review.

Amendment of Regulations regarding Fees Payable

During the year the Regulations of the Horse Breeding Act were amended to provide that the total annual fee payable in respect of a stallion sixteen years' old or over sixteen is £1 1s., instead of £3. The annual fee payable for stallions fifteen years' old and under remains at £3.

SUMMARY OF EXAMINATIONS, 1942-43.

—	Draught.		Light.		Pony.		Total.	
	Examined. 93.	Certificated. 82.	Examined. 46.	Certificated. 40.	Examined. 41.	Certificated. 38.	Examined. 180.	Certificated. 160.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bog Spavin	..	..	..	..	..	..	..	..
Bone Spavin	..	..	..	..	..	..	..	..
Chorea (Nervy)	..	..	..	..	..	..	..	..
Curb	..	..	1	2.173	..	..	1	.6
Cataract	..	..	1	2.173	..	..	1	.6
Ringbone	1	1.075	..	..	..	..	1	.6
Sidebone	2	2.150	1	2.173	..	..	3	1.6
Stringhalt	..	..	..	..	..	..	..	..
Thoroughpin	..	..	..	..	..	..	..	..
Through unsoundness	3	3.225	3	6.519	..	..	6	3.4
Through disapproval	8	8.602	3	6.519	3	7.317	14	7.7
Total	11	11.827	6	13.038	3	7.317	20	11.1

SUMMARY OF EXAMINATIONS, 1941-42.

—	Draught.		Light.		Pony.		Total.	
	Examined. 123.	Certificated. 94.	Examined. 49.	Certificated. 40.	Examined. 34.	Certificated. 28.	Examined. 206.	Certificated. 162.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bog Spavin	..	..	..	..	..	..	..	..
Bone Spavin	1	.813	..	..	..	..	1	.485
Chorea (Nervy)	..	..	..	..	..	..	..	..
Curb	..	..	..	..	1	2.941	1	.485
Ringbone	..	..	1	2.040	..	..	1	.485
Sidebone	13	10.569	1	2.040	1	2.941	15	7.282
Stringhalt	2	1.626	..	..	..	..	2	.970
Thoroughpin	..	..	..	..	..	..	..	..
Through unsoundness	16	13.008	2	4.080	2	5.882	20	9.707
Through disapproval	13	10.569	7	14.286	4	11.764	24	11.647
Total	29	23.577	9	18.366	6	17.646	44	21.354

Horses are aiding the war effort by replacing motor transport.

Parades for the Coming Season

Owing to the petrol restrictions, a schedule of stallion parades cannot be arranged for this season. Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received. Applicants should state which main town would be most suitable for them to present their stallions for examination, and they will, in due course, be advised of date, time, and place of examination arranged.

It is felt that by such an arrangement, provided owners forward their applications by 1st July, as is required, every stallion will be examined before the commencement of the breeding season.

Application for registration must be made on the prescribed forms before the 1st July, and must be accompanied by a fee of £3 (£1 for registration and £2 compensation fee) in respect of stallions fifteen years of age and under, and a fee of £1 1s. in respect of stallions sixteen years or over sixteen years. The necessary forms may be obtained from the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Change of ownership must be notified without delay, in order that certificates of registration may be endorsed accordingly. Registration expires within 30 days of change of ownership, unless the required notice is given.

Sow Certified Pasture Seed

Farmers contemplating the purchase of pasture seed would be well advised to select certified seed in preference to any other.

The certification schemes were brought into operation for the purposes of guaranteeing the identity of seed because it was realized that the strain of pasture plants is very important.

There are good and bad strains in pasture plants, just as there are in live stock, and without a scheme of certification one cannot be sure of obtaining the desired ones. For example, some varieties of subterranean clover are early-maturing, stemmy, and much inferior in productivity to later-maturing strains; certain strains of rye grass are persistent, while others are only short-lived, and so on, but one could not detect those characteristics by an examination of the seed.

Farmers should note that it is illegal to sell seed as "certified" unless the seals affixed by the certifying officer on the sacks are unbroken. This does not apply to quantities less than 60 lb. of perennial rye grass, 10 lb. of Phalaris tuberosa, 14 lb. of subterranean clover, or 5 lb. of white clover.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

THIS month many of the bright summer and autumn flowering annuals and perennials begin to fade. When flowering is finished, the plants should be allowed to remain for a few weeks to die back. If the space is required, however, they may be partially cut back, lifted and placed in a sheltered part of the garden. Dahlia tubers, after being lifted, should be sheltered from frost, and a light sprinkling of soil should be placed over them. Named varieties will need particular care in labelling. A sharpened, thin, wooden label, lightly painted, on which the name has been written with a soft lead pencil, will be found satisfactory if stuck securely into one of the tubers. Dahlias should not be left in the beds over winter, because if the soil is very wet during that period, many varieties will fail to grow in the spring.

After lifting the plants, dig the old mulch, or a generous amount of added organic matter, into the beds, and about every second or third year apply from 4 to 6 oz. of agricultural lime per square yard. This digging, which should be to the full depth of the spade if the top soil will allow, should be left as rough as possible. Winter frosts and rain will then have an opportunity to mellow the soil, and it will be in good condition for spring planting. If available in sufficient quantity, wood-ashes may be substituted for the lime.

Incurved type of Chrysanthemum.

Chrysanthemums

Early in May, chrysanthemums are at their best. Plant breeders have provided a very wide range of beautiful varieties to choose from, and when these flowers are at their best is the time to choose the kinds which please us most. Among the large-flowered single types are:—*Red Rover* (syn. Rob Roy), a chestnut red with a yellow centre; *Shirley Higgins*, a rich, bright crimson with a yellow centre; *Healesville Bronze*, a fine bronze colour; *Mrs. A. J. Whitehead*, a good yellow; *White Mensa*, white with a deep yellow centre; *Lilian Hislop*, a white; *Mrs. A. J. Whitcher*, chrome yellow; *Mrs. J. T. Smith*, a coppery bronze; *Healesville Beauty*, a pink and buff. If disbudded and well-fed, some of these varieties will produce blooms six inches in diameter.

Among the decorative types which have more petals and are very suitable for the garden and for cut flowers are:—*William Renshaw*, a salmon rose; *Shirley Glory*, a brilliant scarlet terra-cotta; *Ruby Jones*, deep yellow; *Sungold*, a golden shade; *Molly Hennings*, a deep mauve; *Candida*, a pure white; *Golden Favourite*, a deep yellow; *Lilian P. Bird*, a quilled-petalled pink.

For the enthusiast who will give particular attention to soil, feeding, disbudding and shading, the following large-flowered incurved and reflexed types will have a special appeal:—*Thos. W. Pockett*, pink; *Louisa Pockett*, a white to pearly pink in the late flowers; *Billie Mitchell*, a golden flower with rich large petals; *Mrs. Milton Gray*, a pale primrose, compact bloom of recent introduction; *J. S. Lloyd*, a lemon shade; *William Turner*, a white; *Harold Alston*, crimson and gold.

Cuttings of chrysanthemums may be taken in mid-July, and they will be ready to plant out in their permanent positions at the end of September.

Lawns

The dry weather in the autumn made it difficult to maintain the lawns in their best condition. Many brown patches occurred in some lawns. Sometimes these were due to lack of water, or insufficient water, and in these cases when water was applied a rapid improvement in the colour was noticed. In other instances, watering and

even manuring failed to produce an improvement. The grass had died, or was dying rapidly. In such lawns, the first 2 inches of a small patch of turf should be cut out and examined, and if tunnels are found and the roots of the grass appear to have been eaten, it is probable that cockchafer grubs are responsible for the brown areas. The fat, white curled grubs themselves may sometimes be observed in the soil. The best method of destroying these grubs is to water the lawn with a mixture of ½ lb. arsenate of lead in water per 100 square feet. A leaflet containing further particulars of the control of this pest is available free on application to the Biologist, Plant Research Laboratory, Burnley, E.1.

Gladioli

Gladioli plants should be lifted about six weeks after blooming and before the tops have completely died down. The tops may be allowed to dry off naturally, or they may be cut off about 4 to 6 inches above the corms, which are then put aside to dry. When dry, they should be cleaned, dusted with naphthalene crystals, and put away until next planting season. It is advisable to inspect them occasionally during the storage period.

THE VEGETABLE GARDEN

Beds in the vegetable garden which are to be spelled during the winter should be dug deeply and the surface left as rough as possible. Spread wood-ashes or lime over the surface at the rate of about 4 oz. per square yard. Another treatment for these beds, and one which is very desirable because of the shortage of animal manures and nitrogenous fertilizers, is to sow peas and barley, or encourage a good growth of weeds and grasses, for digging under in the spring.

Raised Beds

During the winter months, and particularly in southern Victoria where the winter rainfall is usually regular and the soil remains wet until late spring, it is advisable to build up all vegetable beds about 8 or 9 inches above the paths. This will ensure good surface soil drainage and better growth of winter crops.

Cabbages

In May, seed of *Early Flat Parisian* and *Irish Eastham* cabbage may be sown in seed-boxes or seed-beds. Cover the seed with about half an inch of fine sandy soil. Choose a sunny situation. Plants of *Eastham* cabbage may be put out this month. Space them at least 2 feet apart. Before planting, dig in 3 or 4 oz. of blood and bone manure per square yard.

Broad Beans and Peas

Sowings of broad beans and peas can be made this month. Follow the instructions given last month for broad beans. *English Wonder* and *Melbourne Market* are suitable varieties of peas to sow. Space the rows about 20 inches apart and allow about 2 inches between the plants. Superphosphate should be dug into the soil at the rate of 1 oz. per square yard before the seed is sown. It is not advisable to place the superphosphate in the drill in contact with the seed. When they appear above the surface, the young shoots should be protected from birds by a covering of fine-mesh wire netting.

Onions

Silverskin and *Early Barletta* onion plants can be put out now. Rows should be spaced 10 inches apart and 4 inches between plants will be sufficient. Do not plant too deeply. The base of the onion plant should not be more than about half an inch in the soil. The onion is a surface feeder and resents being planted deeply.

Seed of *Victorian Brown*, *Brown Spanish* and *White Imperial Spanish* onions may be sown in a seed-bed. A good plan is to sow the seed in rows about 8 inches apart so that the spaces between the rows may be hoed lightly to suppress weed growth. Cover the seed to a depth of about half an inch. These seedlings will be ready for transplanting in July.

Leek

Seed of *Musselburgh*, *London Flag*, or *Lyon* leeks can be sown in their permanent positions, or in seed-beds for transplanting in early spring. Leeks make a much larger top growth than onions, and require wider spacing between the rows. Two feet between rows and 6 inches between plants will be found convenient.

IN THE ORCHARD

Contributed by the Horticultural Division

DURING the winter months, fruitgrowers will have time to consider plans for the future of their properties. It may be decided, for instance, that portion of the area is no longer profitable, and the grower will be faced with two alternatives. Either he will grub out the trees or rework them. The question of deciding the best means of managing an orchard containing a number of old trees is always a difficult one, and some growers have a natural dislike for using the axe on trees which have provided them with a livelihood for many years. Admittedly, this would be a drastic method of dealing with healthy clean-limbed trees, just because they are of unwanted varieties. Such trees may be profitably reworked to more commercial varieties. However, where the trees are old rough-barked specimens, providing shelter for numerous pests and diseases, their removal is probably justified.

The policy of long-term rotations for orchards has probably received little consideration by most fruitgrowers, although instances are known in which such a system is practised with success. All fruitgrowers realize that the most profitable period for a patch of fruit trees, with the possible exception of some long-lived varieties growing under good conditions, is from 8 to 25 years. Individual trees may continue profitable production for longer than this period, but usually the average production declines for various reasons. A block of old apple trees is very difficult to keep reasonably free from codling moth, woolly aphis, and red spider, while fungous diseases such as armillaria and polystictus are frequent inhabitants. In the case of peaches, apricots, plums, and citrus, old age is signified by barren patches on the limbs or root troubles due to poor drainage or fungi, and production likewise decreases. Summed up, it means that the old block costs more for sprays, and, because the yield is gradually declining, the cost of production per case increases until the block becomes no longer profitable to work.

The pleasure of orcharding is undoubtedly increased when the property includes a block of healthy vigorous young trees which are easy to spray, and produce quantities of good quality fruit with a minimum of waste. The suggestion is made, therefore, that a portion, say 1/20th of the total area of orchard, should be grubbed out and replanted each year. By this method, the old trees could be eliminated gradually without any great expense. With such a policy of replanting, it would be possible to change the variety of tree in accordance with change in demand, and the property would maintain its value instead of gradually deteriorating, an important point when it may be sold or passed on from father to son. If possible, the land which has been grubbed out should be rested for a year or two, either by sowing down to pasture or using it for the cultivation of annual crops, such as vegetables or tomatoes.

Varieties of Fruit Trees

The following list of fruit trees is provided for the information of intending planters. Apple, pear, plum, and cherry trees should be planted so that adequate cross pollination is provided. Although only limited information concerning compatability of the various varieties is available, observations have shown that certain varieties bear satisfactorily when planted together. The varieties are grouped, therefore, according to suitability as mutual cross pollenizers.

Apples.—Ballarat, Statesman, Democrat, Jonathan, Red Statesman, Cleopatra, Crofton, King Cole, Granny Smith, Delicious. Gravenstein (unsuitable for cross pollination of other varieties, but bears satisfactorily when planted with several of the aforementioned kinds). London Pippin, Rome Beauty.

Pears.—Williams' Bon Chretien, Beurre Bosc. Packham's Triumph, Winter Nelis, Winter Cole, Josephine.

Cherries.—Burgsdorff, Early Purple Guigne, Black Bigarreau, Chapman. Bigarreau Twyford, Bedford Prolific, Eagle's Seedling. Reine Hortense, Florence. St. Margaret, Bigarreau Napoleon.

Plums (European).—Black Diamond, Angelina, Jefferson. Grand Duke, President, King Billy. Early Orleans, Prune Splendour, Prune Sugar. Coe's Golden Drop, Magnum Bonum, Pond's Seedling, Robe de Sargent, Prune d'Agen.

Plums (Japanese).—Narrabeen, Santa Rosa. Satsuma, Kelsey. Formosa, Wickson, October Purple, Burbank.

Peaches (market).—In order of ripening—Mayflower (very shy bearer, but planted because of earliness and consequent high prices), Sneed, Le Vainqueur, Brigg's Red May, High's Early Canada, Anzac, Beale, Pump's Seedling, Zerbe's, Ireland's, Noonan's, Webbis, Smith's Seedling, Peregrine, Bendigo Beauty, Catherine Anne, Elberta, Crawford, Millicent.

Peaches (canning).—Tuscan, Levis, Sim's, Nicholl's, Phillip's, Goodman, Golden Queen, Pullar's Cling, Thiele's Cling.

Nectarines.—Early Rivers, Goldmine.

Apricots.—Newcastle, Ouillins, Moor Park, Shipley's Blenheim, Trevatt.

Quinces.—Smyrna.

Figs.—Brown Turkey, White Genoa.

Growers requiring further information regarding suitability of fruit tree varieties in their districts should get in touch with their local orchard supervisor, or write to the Department of Agriculture, Melbourne, C.2.

Orchard Sanitation

Where brown rot has caused damage in apricots during the past season, all mummified or infected fruits which have dried out on the tree should be collected and burnt. The trees should be inspected for signs of diseases, such as shot hole and brown rot lesions on twigs, which, if present, should be cut away at pruning time. An application of 6:4:40 Bordeaux mixture in the autumn will assist in the control of shot hole of apricots.

Losses from rust infection in canning peaches were severe during the past season, and to minimize the trouble, growers, when ploughing, should bury deeply the leaves from infected trees. Bordeaux mixture 6:4:40 at the pink bud stage, followed by dry-mix lime sulphur 25 lb. in 100 as cover sprays for the fruit, are necessary to control this disease.

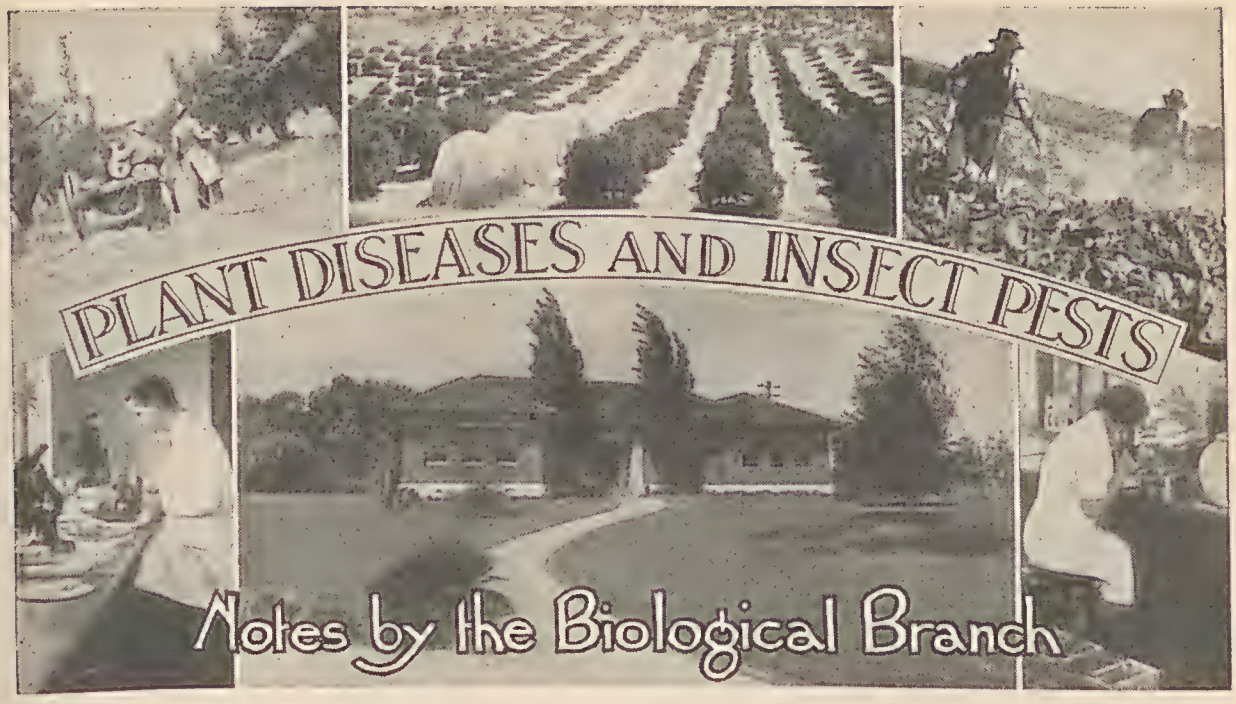
The False Moult in Pullets

The false moult in pullets usually occurs during the months of April and May when eggs are at their highest price and, therefore, makes a very great difference to the poultry-keeper's income.

It is one of the many problems brought about by increased egg production and intensive poultry farming. Originally fowls laid only in the spring time—the natural breeding season—but now they lay right through the year. Again, pullets hatched in the spring formerly did not lay until the following spring when they were approximately twelve months old, whereas now they commence laying when they are five to six months old. If they have been laying for some time before the natural moulting season in April and May there is always the likelihood of a number of them breaking into a false moult. Early hatched pullets are most susceptible to this moult, but it sometimes happens even in late hatched birds. There is no way of completely avoiding it, but, if pullets are bred from carefully selected high producing stock and are comfortably housed, well fed, and carefully handled, the false moult is less likely to occur.

The young birds should be housed in their permanent laying sheds before laying commences, because shifting them later invariably upsets them. Care should be taken that they receive sufficient food for body maintenance as well as for egg production, always remembering that extra food is needed as the weather becomes colder. There is little danger of over-feeding a good pullet.

Heavy laying pullets usually are highly strung and nervous, and always should be handled carefully. Frights will often upset them: in fact any fault in the management of pullets, especially during April and May, is likely to cause them to break into a false moult with the result that egg production will cease for approximately two months.



CLUBROOT OF CRUCIFERS

Clubroot is a soil-borne disease which has been established for many years in some of the principal vegetable-growing districts in the State. The disease is mainly restricted to heavy soil districts, and appears to be most prevalent in the Werribee Irrigation Settlement.

The disease is capable of infecting practically all cruciferous crops, including cabbages, cauliflowers, Brussels sprouts, turnips, and radishes, as well as many cruciferous weeds, such as shepherds' purse, charlock, mustards, &c.

The most characteristic disease symptom, as the name implies, is the abnormal spindle-shaped overgrowths which occur on the main and lateral roots. These malformations cause a stunting of growth due to interference with the normal functions of the roots. Severely-infected plants may become wilted during hot days, owing to the inability of the infected roots to absorb sufficient moisture to maintain the turgidity of the leaves.

The organism responsible for clubroot is a slime-mould, *Plasmodiophora brassicae*, which is capable of living in the soil for at least five years, even in the absence of host plants. Plants may become infected either in the seed-bed or in the field. Disease development is favoured by heavy acid soils.

Control measures are very difficult, and in heavily-infected soil it would be better to abandon the growing of cruciferous crops for at least five years, rather than to attempt to control the disease. If this is not possible, then a rotation as long as practicable should be adopted between cruciferous crops. Other control measures are:—

1. Liming of infected soil.

2. Seed-bed treatment with corrosive sublimate solution.

Cauliflowers infected with Clubroot.

Liming the Soil

Heavy liming will definitely suppress the disease in time, but it is not always practicable, e.g., if potatoes are included in the rotation the high soil alkalinity induced by liming will favour the development of common scab. The amount of lime to apply depends upon the initial acidity of the soil, but a tentative recommendation is 1 to 2 tons per acre of agricultural lime, applied several months before planting the crop.

Seed-bed Treatment

Seed beds should be watered with 1 in 2,000 corrosive sublimate (1 oz. in 12½ gallons of water) at the time of sowing the seed, and again when the plants are about 2 inches high. The solution is watered evenly over the bed through a rose. The bed should be moist before treatment.

As corrosive sublimate interacts with metals, a wooden or earthenware container should be used for mixing purposes. Care should be exercised in the handling of corrosive sublimate (mercuric chloride), because it is a deadly poison.

Supplementary control measures which are nevertheless important are:—

1. Clean cultivation to suppress weeds which may also carry the disease.

2. The destruction, preferably by burning, of diseased refuse from infected fields.

The practice of ploughing in diseased plants is a bad one, as the organism produces numerous spores in the roots which are returned to the soil when the roots rot.

CEREAL SMUT DISEASES

The smut diseases of cereals may be divided into two groups, depending on whether or not they are capable of being controlled by treating infected seed with fungicidal dusts.

The first group, which can be controlled by this means, includes:—Flag Smut and Bunt or Stinking Smut of Wheat; Loose Smut of Oats and Covered Smut of Barley. In the case of each of these diseases, the spores of the fungus adhere to the outside of the seed coat and are, therefore, exposed to the action of fungicides. In the case of Loose Smut of oats, the spores while being outside the seed coat may be covered by the oat hulls.

All these diseases infect the cereal plants in the early seedling stage and develop within the plant. While flag smut of wheat is principally seen on the leaves and stems of infected plants, the other diseases referred to above attack the grain, which is replaced by a mass of dark spores which is usually covered by a membrane. This membrane distinguishes these

Left—Loose smut of barley. Right—Covered smut of barley.

diseases from the loose smuts of wheat and barley referred to below, in which the spores are not covered.

Clean grain becomes infected by wind-blown spores or by contamination during harvesting.

Pickling infected seed with copper or mercurial dusts will effectively reduce the incidence of these diseases.

The second group of smut diseases, which are not amenable to control by pickling, are the loose smuts of wheat and barley respectively.

Infection with these diseases takes place at flowering time, and the mycelium of the fungus grows *within* the developing seed and is, therefore, protected by the seed coat from the action of fungicidal dusts. When infected seed is planted, the fungus grows within the plant and attacks the head, forming a loose mass of dark spores. These are readily blown in the wind and may infect the flowers of healthy plants. Grain from crops showing much loose smut should not be used for seed purposes.

The use of resistant varieties offers the most satisfactory method of controlling cereal smut diseases, and much progress has already been made in the development of suitable varieties.

COLLAR ROT OF CITRUS

Collar rot is one of the most serious diseases of citrus trees in this State. It is caused by a fungus which attacks the bark of the tree near ground level. The bark dies and later dries out and splits. A copious development of gum usually accompanies the other symptoms, so that the disease is sometimes referred to as *Gummosis*. The diseased area gradually extends, and may finally completely girdle the trunk. Some weeks after the death of the bark the leaves on the affected side, or all over a tree that has been girdled, become paler in colour. The veins usually fade before the remainder of the leaf, thus giving a pattern of yellowish veins on a green, or greenish-yellow, background. Finally, the entire leaf will become yellow in colour. If steps are not taken to control the disease, the tree may be killed.

Control

The disease is favoured by bad drainage, so that it is important to ensure proper drainage in order to control the disease.

All the soil that is heaped round the trunk should be removed, and the tops of the main roots near the diseased area should also be exposed, as the disease often spreads down on to these roots.

Collar rot of citrus showing gum exuding from affected trunk.

Then cut away all the dead tissue with a sharp knife and paint the area with one of the pastes recommended below.

If the trees will be subsequently fumigated with hydro-cyanic acid for scale insects, the use of a paste containing high concentrations of copper is dangerous, and growers should use a paste of 1 lb. of zinc sulphate, 1/5th lb. of copper sulphate, and 1 lb. of lime to 1 gallon of water.

If, however, no fumigation will be carried out, a paste of 1 lb. of copper sulphate, 2 lb. of water-slaked lime, and 1 gallon of water may be used.

GREEN VEGETABLE BUG

The green vegetable bug, *Nezara viridula* L., which first appeared in the northern part of Victoria in 1936, has now spread over the greater part of the State, occurring for the first time in appreciable numbers in the suburbs last month. It is chiefly a pest of beans, both of the dwarf and climber classes, and tomatoes, but may attack other crops, notably potatoes, peas, pumpkins, and melons.

Both the immature and adult insects feed by sucking the sap from the host plants. Although all parts of the plant may be attacked, the

most noticeable damage is caused to young shoots, or to the fruit. When young shoots are attacked, they may wilt, wither, and finally die, and growth of that portion is stopped. When tomato fruits are attacked, they become mottled and discoloured, with the formation of a small brown corky area at the point of attack. With beans, the young forming beans are sucked dry, preventing further growth.

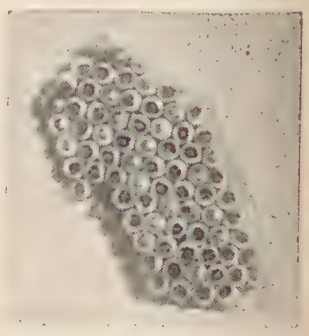
Although large numbers of this pest may be present in a crop, the adults are not easily seen, as their colour blends so well with that of the crop. When infested plants are disturbed, however, the bugs either drop to the ground or fall on to the lower branches of the plant.

The bugs over-winter in the adult stage, and with the oncoming of winter change from their normal green colour to dull-brown. They hibernate among the leaves of old plants, under the bark of trees, or in cracks and crevices in fencing posts. Early in spring they emerge from these positions and commence egg-laying almost at once.

The green vegetable bug—adult insect.
a. Top view. b. Side view.

The eggs, which measure roughly 1/16th of an inch in height, are laid in clusters of from 30 to 120 eggs, and are placed in regular parallel rows firmly glued together on the leaf. These egg clusters at first are pale-yellowish, but as hatching approaches become pinkish, and finally, just before hatching, are reddish-brown.

The young bugs from these eggs measure roughly 1/16th of an inch in length, and are bright orange in colour. They usually remain clustered around the egg-mass for a day or two before feeding. While feeding, they gradually increase in size and change colour, until just before becoming mature, they take on the green colour so typical of the normal adult.



Egg cluster of green vegetable bug. Note eggs which have hatched.

Adult bugs are shield-shaped, about $\frac{5}{8}$ths of an inch in length, and usually of a uniform green colour during the summer months. They fly quite readily on a warm to hot day. The complete life cycle occupies some five to eight weeks.

For the control of this pest at the present period of the year, very little can be done in the way of any insecticidal treatment. Clean cultivation is, however, most important, as the adult bugs hide amongst the leaves of tomato and bean plants and any rubbish that may be present, and shelter there during the winter months without feeding, waiting for the first signs of spring to recommence their activities. Thus, during the coming months, home gardeners, both in the suburbs and the country, should pay particular attention to the destruction, by burning, of any rubbish where these bugs may hide. By so doing, they will tend to minimize the losses that may occur next spring and summer.

GARDEN SPRINGTAILS

Particularly in the vegetable garden at the present period of the year, garden springtails are likely to be very troublesome.

There are several different species of these insects, and they are frequently to be found floating as a scum on the surface of small collections of water immediately after rain. The most commonly found species in Victoria

is whitish in colour, measuring up to one-eighth of an inch, entirely wingless, and found hiding in soil which is very moist and richly abundant in decaying organic matter, such as stable manure.

Normally, they live amongst such decaying vegetable matter, and under leaves, moss, &c. However, they are capable of multiplying to enormous numbers in a short time, and then they may attack germinating seeds, such as peas and broad beans, and particularly where these seeds have an initial injury of some kind, they continue the work of destruction. These insects are frequently the cause of poor germination in peas and beans early in the season.

The life history is usually completed in the soil. The adults lay small whitish spherical eggs, either on the surface of the soil or under clods of earth, usually in clusters. These hatch into very small semi-transparent springtails,

Common White Springtails.

[After *N.S.W. Agr. Gaz.*

very similar in shape to the adult insect. These young forms feed on decaying vegetable matter, and after a series of moults the adult insects appear.

Where it is proposed to plant seed in soil known to have heavy concentrations of springtails present, the ground should be thoroughly prepared prior to planting, and given several applications of lime or tobacco dust, which must be well forked in.

If seeds or seedlings already planted out are being attacked, the soil in the immediate vicinity should be thoroughly watered with the following mixture:—

Nicotine sulphate	..	1 oz.
Soap	..	2 oz.
Water	..	4 gallons.

BED BUGS

The common bed bug, *Cimex lectularius* L., is, without doubt, one of the most obnoxious of the insects which attack man. Its blood-sucking habits and filthy odour are well known. This season numerous reports have been received that this insect has been more troublesome than usual.

Bed bugs are to be found in many situations and localities, but chiefly in old buildings, old guest houses, and the like. The sources of infestation are many, and the infestation of a house is not necessarily due to neglect, being commonly caused by migrations from neighbouring properties. They were at one time frequently encountered in boats, railway carriages, &c., and were carried into the home in this manner. They are particularly abundant in old houses containing hessian walls over which wall paper has been hung.

Bed bugs normally crawl from their hiding places, and attack the face, neck, or uncovered parts of the legs and arms of their victims. If undisturbed, they feed to their full capacity, which in the case of adult bugs usually takes some ten to fifteen minutes. After a full meal, the bugs go into hiding to digest the blood, which may take several days. The effect of the "bite" varies greatly with the individual attacked. In some, little or no discomfort results, while in others the bite produces a small hard swelling, white in colour. It may be accompanied by a swelling and a disagreeable inflammation, and in such cases is usually accompanied by restlessness and loss of sleep due to the presence of the insect.

It is a matter for conjecture at the present time as to whether the bed bug transmits human diseases.

Bed bugs are oval, flattened, reddish-brown, wingless insects measuring roughly one-quarter of an inch long when fully grown. They possess piercing and sucking mouth-parts, and are nocturnal in habit, hiding during the day in cracks and crevices, or under loose wallpaper.

The eggs are whitish in colour, oval in shape, and about 1/25th of an inch in length. They possess at the upper end a small cap or lid, out of which the young bug emerges on hatching. They are laid intermittently, for a long period, in cracks and crevices of beds and furniture, under loose wallpaper, and in all hiding places, to which places they are glued.

The common bed bug (enlarged).

A single female bug is capable of laying up to 250 eggs. These eggs hatch in from six to ten days to young nymphal bugs, which commence feeding at once. The total length of this feeding period varies considerably from a minimum of, roughly, seven weeks to as long as six or more months, depending chiefly on the availability of food. The adults are remarkable for their longevity, a case being on record of where a bug lived for twelve months without food. However, under normal conditions, there may be three or four generations per year.

If an infestation of bugs in a house or building is only moderate, it may be exterminated only by a vigilant and systematic hunt, and thoroughly spraying and saturating all cracks and crevices with kerosene, turpentine, or one of the proprietary liquid fly sprays. Where the infestation, however, is severe, the only satisfactory method is the use of hydrocyanic acid gas as a fumigant. This, on account of its dangerous nature, must only be carried out by an expert fumigator.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Pietsch, R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark," Nhill	Spiers, Albert	Bamawm Extension
Ellwood, A. H. ..	Paschendaele	State Experiment Farm ..	Rutherglen
Fairchild and Clutterbuck	Tinamba	Sutherland, R. N. ..	Nullawill
Geddes, L. D.	Bungaree	Trenery and Soderlund ..	"Promview," Foster
Hamblin, A. T., & Sons..	Toolleen	Trigg, A. J.	Bungaree
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
		Tweddle, J. T.	"Winlaton," Shepparton
Hawtin, I. E. and F. ..	"Rossmoyne," Colac	Walch, M. U.	Baring
Haywood, Dr. A. R. ..	Hastings		

Licensed Skin Buyers

Sheep Owners Protection Act

Following is a list of persons licensed, under the Sheep Owners Protection Act, to buy raw sheep skins. The licences have effect until the 31st December, 1943 :—

Licence No.	Holder of Licence.	Address.
1734	Allan, J. K. ..	19–23 King-st., Melbourne
1721	Angliss, W., and Co. Pty. Ltd.	42 Bourke-st., Melbourne
1643	Austin and Ford Pty. Ltd.	Hopetoun
1648	Australian Central Woolgrowers Realisation	590 Lt. Bourke-st., Melbourne
1592	Banks, C. L. ..	Barkly-st., Ararat
1678	Bannon, W. J. ..	St. Arnaud
1593	Barrett, H. L. ..	12 Bond-st., Sale
1661	Bartlett, A. E. ..	High-st., Echuca
1617	Bennett, S. C. ..	71 Isabella-st., Geelong West
1618	Barman, D. ..	Cr. Shelley-st., and Broadway, Elwood
1594	Biggs, H. A. ..	Commercial-st., Korumburra
1711	Black, S. B. R. ..	129 Albert-st., Ballarat
1677	Borthwick, T., and Sons (Aust.) Ltd.	84 William-st., Melbourne
1683	Bourke, D. ..	89 Cox-st., Hamilton
1619	Brooks, E. J. ..	Quambatook
1705	Brown, C. ..	Stanhope-rd., Rushworth
1645	Burns and McCleave	206 Mair-st., Ballarat
1644	Burrows, A. ..	Scoresby-st., Kerang
1595	Burton Stores Pty. Ltd.	Binney-st., Euroa
1620	Butler, E., and Sons	Tallangatta
1696	Byerley, H. M. ..	115 Wright-st., Adelaide, S.A.
1612	Callam, P. J., and Son	6–8 Moorabool-st., Geelong
1596	Canfield, E. F. ..	Gilles-st., Rochester
1687	Carlile, T. H. ..	Watson-ter., Mt. Gambier, S.A.
1646	Cary, W. A. ..	High-st., Heathcote
1621	Cass, R. ..	Chetwynd
1622	Claffey, A. S. ..	Taverner-st., Rainbow
1658	Clark, J. ..	Lonsdale-st., Hamilton
1662	Clarke, J. T. ..	160 Firebrace-st., Horsham
1718	Collins, H. G. ..	Kaniva
1587	Cook, T. J. ..	Black-st., Terang
1660	Cook, W. J. ..	Allansford
1597	Cooke, E. J. ..	McKenzie-st., Murrayville
1729	Cooper, A. S., Pty. Ltd.	87 Lambeth-st., Kensington
1598	Coulstock, K. ..	65 Welshford-st., Shepparton
1691	Coulstock, T. R. A.	Allan-st., Kyabram
1733	Crosthwaite, I. S.	Rosebery
1697	Curry, T. ..	St. Arnaud
1599	Dallimore, P. J.	Brook-st., Camperdown
1712	Devine, P., and Co.	McDonald-st., Numurkah
1647	Dillon, V. G. ..	Wattle-st., Manangatang
1692	Dimboola Stores Limited	Lochiel-st., Dimboola
1623	Downes, A. J. ..	Ritchie-st., Dunkeld
1727	Duggan, T. A. ..	Mollison-st., Kyneton
1686	Eales, F. ..	Bell-st., Penhurst
1624	Edgecombe, J. H.	Sea Lake
1682	Egan, B. F. ..	Henty-st., Portland
1702	Egan, F. H. ..	Avoca
1737	Elias, A. ..	Main-st., Tallangatta
1663	Ellis, C. J. ..	Euroa
1659	Evans, C. J. ..	83 French-st., Hamilton
1713	Evans, W. J. ..	Boort
1664	Ferguson, F. S. McN.	Market Square, Bendigo
1625	Flanigan, J. ..	Murray-st., Colac
1600	Franks, R. M. ..	Tallangatta
1601	Freeman Bros. ..	Scott-st., Warracknabeal
1602	Freeman, W. G.	Elmore
1706	Gelbart, J. M. ..	20 Wilson-st., North Carlton
1626	Gordon, C. G. ..	645 Spencer-st., Melbourne
1714	Gorton, C. H. ..	Vickery-st., Alexandra
1627	Greig, J. W. ..	Rowe-st., Ouyen
1688	Hardy, F. A. ..	Myamyn
1585	Hargreaves Bros.	High-st., Ararat
1648	Hargreaves, J. R.	Terang-rd., Mortlake
1673	Harper, W. ..	Alberton
1628	Harris, A. J. ..	19 Bowen-st., Warragul
1629	Harris, L. ..	Lower Main-st., Stawell
1588	Haughton, Wm., and Co. Pty. Ltd.	545 Lt. Collins-st., Melbourne
1630	Hegerty, W. J. ..	Charing Cross, Bendigo
1586	Hicks, J. T. ..	Goroke
1631	Hill, D... ..	6 Phillip-st., Warracknabeal
1698	Hogan, A. P. ..	Tumbarumba, N.S.W.
1603	Holdsworth, W. ..	Havelock-st., Beaufort
1707	Howard, E. J. ..	Wood-st., Donald
1732	Howard, J. H. ..	Commercial-st., Korumburra
1632	Howlett, A. E. ..	Casterton
1604	Jackson, J. Pty. Ltd.	2 Main-st., Bairnsdale
1613	James, D. ..	199 Boundary-rd., North Melbourne
1649	Jobe, C. E. ..	29 Lower Main-st., Stawell
1633	Johnson, A. P. ..	Station-st., Lake Boga
1722	Jones, A. ..	Bombala-st., Delegate
1650	Jones, E. V. ..	Harrow
1634	Kennon, J., and Sons Pty. Ltd.	River-st., Richmond

Licence No.	Holder of Licence.	Address.
1635	Kewin, R. F. ..	Wheeler-st., Corryong
1665	Khan, B. A. ..	Market Square, Bendigo
1681	Kilroy and Story	High-st., Heathcote
1735	Lindsay, D. ..	Charles-st., Jeparit
1703	Lockwood and Sons Pty. Ltd.	Birchip
1693	Long, C. J. ..	12 Campbell-st., East Kew
1636	Lynch, M. T. ..	Rushworth-rd., Kyabram
1676	McColl, D. ..	Tatura
1738	McDonald, I. A.	Corryong
1637	McLean, A., and Son	Smythe-st., Benalla
1605	McLennan, D. ..	Prospect-st., Wycheproof
1680	McLennan, D. J.	Sea Lake
1615	Marshall, G. J. ..	Edenhope
1719	Miller, E. E. ..	Church Hill, Rushworth
1720	Moore, D. R. ..	Hamilton-st., Kilmore
1651	Murrell, H. ..	Casterton
1589	Murrells and McNicol	Napier-st., St. Arnaud
1699	Nicklen, A. R. ..	Talbot-rd., Maryborough
1656	Niddrie, L. G. ..	27 Lonsdale-st., Hamilton
1606	North Western Wool and Skin Stores	Swan Hill
1614	O'Beirne, J. and F.	Linton
1730	O'Beirne, J. D. ..	Hamilton-st., Horsham
1675	Oppenheim, W. ..	21 Peel-st. north, Ballarat
1689	Payne, A. ..	Nyah West
1608	Perkins, C., Pty. Ltd.	Sturt-st., Mt. Gambier
1607	Perkins, C. T. ..	Robertson-st., Narracoorte, S.A.
1723	Perry, A. J. ..	Princes Highway, Colac West
1616	Pettit, R. ..	McMahon-st., St. Arnaud
1717	Phillips, T. J. ..	Mologa
1638	Phillips Co-operative Society Ltd. (in Liquidation)	Main-st., Minyip
1666	Pyramid Co-operative Society Ltd.	Pyramid Hill
1672	Quarrell, C. C. ..	Cobden
1700	Reason, C. ..	Pekin-rd., Maryborough
1590	Rehfisch, H. K. ..	223 Mair-st., Ballarat
1639	Rice, J. W. ..	20 Doveton-st., Ballarat
1716	Rice, W. T. ..	Bombala, N.S.W.
1708	Rich, H. J. ..	Brougham-pl., Geelong
1674	Robbins, T. ..	Cohuna
1695	Ross and Browster Pty. Ltd.	1 Lt. Curran-st., North Melbourne
1667	Rowan, L. M. ..	Minyip
1668	Ruedin, U. F. ..	Holdsworth-rd., Bendigo
1724	Russell, R. ..	Colac West
1728	Sharrock, C. H. J.	Kyneton Park, Bessiebelle
1679	Short, I. W. ..	George-st., Hamilton
1640	Sims, Cooper Freezing Works Pty. Ltd.	31 Queen-st., Melbourne
1591	Stanton, J. ..	Nelson-st., Nhill
1652	Stephens, J. ..	Murray-st., Colac
1701	Stone, G. W. ..	Main-st., Cohuna
1685	Sutton, J. T. ..	Beaufort
1653	Taylor, H., and Son	Birchip
1609	Teasdale, R. L. ..	High-st., Charlton
1725	Thomas, F. ..	Tintaldra
1654	Timms, N. ..	Minyip
1736	Trigger, M. E. ..	Pinnaroo
1694	Venables, C. A. ..	Alberton
1655	Vines, A. A. ..	Robinvale
1715	Voges, A. V. ..	Ballarat-rd., Hamilton
1669	Waddington, E. H.	Commercial-rd., Yarram
1657	Waring, M. I. ..	Rippon-rd., Hamilton
1704	Warnock, R. ..	High-st., Yea
1709	Waters, S. H., and Co. Pty. Ltd.	514 Lt. Collins-st., Melbourne
1690	Watson, E. R. ..	Hamilton-rd., McArthur
1710	Westphalen, W. R.	Yaapeet
1641	Wheatland, W., and Co.	Brougham-pde., Geelong
1610	Wheaton, C. M. ..	Miram
1726	Wilkinson, G. R.	Manangatang
1670	Wingfield, E. H.	High-st., Charlton
1671	Wood, H. L. ..	Balmoral
1642	Wright, N. A. ..	124 High-st., Shepparton
1611	Young, H. ..	Orford
1731	Zed, A., and Sons	Commercial-st., Mt. Gambier

Preservation of Button Mushrooms

Button mushrooms are best for bottling, but others may be used although their appearance will not be so good. The older ones are more suited to drying or making into ketchup.

Mushrooms should be freshly gathered, cleaned by wiping with a cloth, peeled, care being taken to remove all spots and soil. Stalks should be cut off level with the cap of the mushroom. They should then be placed in a saucepan, seasoned with salt and pepper, and allowed to heat gently with the lid on. When the juice is drawn and the mushrooms are shrunken they are ready to pack into jars. Juice is poured over and the jars processed by the intermittent sterilization method.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East ..	177
Ballarat Orphanage ..	Ballarat	111	Northcote Children's Farm	Bacchus Marsh ..	156
Banyule Stud Pty. Ltd.	Wangaratta ..	42	Onley, W. H. ..	"Glenholme," Caldermeade	55
Black, I. S., Estate ..	Mount Noorat ..	52	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Clarke, A. B. ..	Glenormiston South	16	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dennis, Mrs. A. A. ..	Frankston ..	33	Poole, M. A. and D.	Caldermeade ..	134
Dookie Agricultural College	Dookie	77	Poole, M. A. and D.	Yannathan ..	72
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Powell, T. S. ..	"Carellen," Mansfield	46
Geelong Grammar School	Corio	68	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	35	Samuel, Misses G. and E.	Lang Lang ..	48
Gorman, A. W. ..	"Cathcart," Alexandra	61	School of Horticulture	Burnley	10
Hollaway, R. W. ..	Caldermeade ..	75	State Experiment Farm	Rutherglen ..	40
Kilmany Park Farm Home for Boys	Sale	94	State Research Farm	Werribee	229
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	Tanner, N. J. ..	Pakenham ..	33
Longerenong Agricultural College	Dooen	43	Vagg, T. E.	Officedale ..	45
			Wells, W. G. ..	Caldermeade ..	65

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Anderson, J. B. ..	Warrnambool ..	19	Carr, W. J. ..	Wollert	65
Andison, J. A. ..	Thomastown ..	46	Child, G. P. ..	Epping	53
Andrew, J. C. ..	Whittlesea ..	121	Christian Bros. ..	Doreen	42
Andrew, W. ..	Whittlesea ..	160	Clark, P. W. ..	Whittlesea ..	62
Andrews, E. H. ..	Templestowe ..	19	Collins, L.	Doreen	48
Barclay, A. H. ..	Whittlesea ..	107	Cornfoot, D. H. ..	Whittlesea ..	43
Barling, J. ..	Mernda	33	Cotchin, J. ..	Woodstock ..	18
Bates D. S. ..	Whittlesea North ..	25	Coulthard, J. J. ..	Whittlesea ..	76
Batten, R. J. ..	Wollert	44	Craker, Mrs. E. ..	Warrandyte ..	2
Benson, R. ..	South Morang ..	35	Cumming, H. R. ..	South Morang ..	23
Bodycoat, A. ..	Wollert	39	Cunningham, E. C. ..	Templestowe ..	23
Booth, Mrs. A. ..	Warrandyte ..	8	Danaher, J. V. ..	Whittlesea ..	70
Bourke, G. J. ..	Fairfield	82	Danns, N. C. ..	Whittlesea ..	34
Bourke, J. W. ..	Somerton	37	Deutscher, H. W. ..	Mernda	168
Bradbury, A. K. ..	Diamond Creek ..	50	Deveny, M. ..	Bundoora ..	51
Bunting, J. ..	Epping	35	Draper, L. S. ..	Wollert	31
Butler, W. ..	Wallan	49	Drysdale, J. C. ..	Warrandyte ..	41
Callaghan, L. ..	Epping	34	Fellows Bros. ..	West Heidelberg ..	52

TUBERCLE-FREE HERDS—*continued.*

Name.	Address.	Number in Herd at Last Test.
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Fox, A.	Mernda	59
Galbraith and Walker	Greensborough	36
Gamble Bros.	Greenvale	156
Gallus, E. A.	Doncaster	14
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	30
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	34
Harding, J. E.	Templestowe	42
Harkness, H. J.	South Morang	31
Hawkes, Miss D.	Warrandyte	21
Hehr, H.	Epping	32
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	11
Jackson, Mrs. M.	South Warrnambool	6
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jones, S. E.	Campbellfield	23
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	28
Kilpatrick E.	Mernda	89
Lane, J.	Warrnambool	9
Latta, Mrs. J.	Warrnambool	6
Levett, E.	Warrnambool	12
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McCulloch, A. A.	Warrnambool	28
McDonald, A. J.	Whittlesea	2
McDowell, R. H.	Greensborough	26
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Maltzahn, Mrs. E. N.	Campbellfield	45
Mason, N.	Donnybrook	52
Maxwell J.	Whittlesea	32
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	6
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	44
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
O'Hern, T.	Epping	58
O'Keefe, J. P.	Warrnambool	21
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Patullo, F. E.	Mickleham	36
Pitson, R. H.	Yarrambat	19
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	48
Rawlings, J. H.	Whittlesea North	41
Rodgers, E.	Whittlesea North	14
Rosewarne, Miss P.	Yan Yean	49
Seeber, B.	Thomastown	28
Shanks, John	Mernda	73
Shaw-Logan T.	Glenroy	103
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Simpson, W. G.	Donnybrook	12
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	81
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	31
Southon, H. W.	South Morang	60
Spruzen, G.	Wollert	41
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Thomas, Mrs. E.	Broadmeadows	11
Thomas, Mrs. V. E.	Yan Yean	31
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Twomey, A.	Greenvale	39
Vallence, C. A.	Epping	11
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	17
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	32
Williamson, J.	Doncaster (High-st.)	4
Willis Bros.	Craigieburn	61
Wilson, J. E.	Diamond Creek	9
Wilson, Mrs. M.	South Morang	14
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Ziebell, H.	Thomastown	32

There are also 571 herds in which 14,297 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

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Results of 1942 Trials

Extracts from the

Eleventh Annual Report on the pasture experimental work conducted by the Department of Agriculture for the Victorian Pasture Improvement League

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist

DURING 1932 the Department of Agriculture established in Southern Victoria eleven major plots and 35 pilot plots under the Victorian Pasture Improvement League scheme. The major plots comprised mowing and grazing manurial trials and sown species trials, and the pilot plots grazing manurial trials and sown species trials.

In 1935, a further twelve mowing manurial plots were added, and a grazing manurial trial was established at Ellinbank. Pasture establishment trials were also put down at Trawalla, Hamilton, and Buckley in the same year. The twelve new mowing trials are smaller than the original mowing manurial trials established at the major plots, and were laid out specifically to investigate responses to potash in the Western District, and lime in Gippsland.

In 1938 the experimental work was extended still further, and two mowing manurial trials were established in the Central District, three in the North-East, and four in the Northern Irrigation area. Complementary grazing manurial trials were located at four of these centres and sown species trials were established at the three centres in the North-East. In the following year a grazing manurial trial was put down at Pirron Yallock to investigate a potash deficiency, and trials towards reclamation of "salted" land were begun at four centres in the Kerang district by an officer of the Department, who was stationed there to undertake the work.

The most recent addition has been the establishment at Ellinbank of a mowing manurial trial to investigate relative responses to various

forms of phosphatic fertilizer, and fifteen new manurial pilot plots at various places in Southern Victoria.

Since the work was begun in 1932 four of the "majors," one small mowing plot and one of the three pasture establishment trials have been terminated and the original 35 pilot plots have been replaced by the fifteen new pilot plots, so that the total number of plots in existence now is 51. Details of these are shown at the end of this article.

Climatic Conditions and Pasture Growth during 1942

A break in the early autumn was followed by a dry spell, and feed was becoming scarce when the position was relieved by heavy rain in May, which ordinarily would have been rather late for satisfactory growth; but fortunately conditions during June and July were relatively mild.

In parts of the Western District and the North-East there was too much rain during the winter months and some flooding occurred, but elsewhere conditions for winter growth were satisfactory.

Spring growth generally was fair to good, but was restricted in parts of Gippsland and the Western District by insufficient rain during October. There were heavy falls of rain during November and some spring flooding occurred in East Gippsland and the North-East, but the late spring was generally dry and ideal for hay making.

Generally speaking, conditions for pasture growth during the 1943 season were good, excepting in the East Gippsland area and the western part of the Central district. A shortage of superphosphate reduced the carrying capacity, however. There was an abundance of herbage in most places during the springtime, and probably more than the average amount of meadow hay was conserved, despite the shortage of manpower.

Operations during the Past Year

Owing to the shortage of staff occasioned by the diversion of officers from V.P.I.L. work to war-time duties given higher priority, it became necessary at the beginning of 1942 to cease the mowing of plots.

Mowing manurial plots have been thrown open to stock, but grazing manurial plots have been maintained without any substantial change, as it was considered undesirable to break the continuity of their treatment, and the sown species trials still remain at all centres.

The new pilot plots are an improvement on the previous ones in that they are subjected to normal grazing; the fertilizer treatments are applied on a standard plan in every case, viz., seventeen strips, each 11 ft. x 66 ft, as follow:—

1. No manure.
2. Super. 180 lb./ac. + carbonate of lime 1 ton/ac. (1942).
3. Super. 180 lb./ac. + carbonate of lime 1 ton/ac. (1942) + muriate of potash 180 lb./ac.
4. Super. 180 lb./ac.
5. Super. 180 lb./ac. + muriate of potash 180 lb./ac.
6. No manure.
7. Super. 90 lb./ac.
8. Super. 180 lb./ac.
9. Basic super. 180 lb./ac.
10. Super. 360 lb./ac.
11. Rock phosphate 180 lb./ac.
12. No manure.
13. Super. 180 lb./ac. + sulphate ammonia 90 lb./ac. + carbonate of lime 1 ton/ac. (1942).
14. Super. 180 lb./ac. + dolomite 1 ton/ac. (1942).
15. Super. 180 lb./ac. + cement ash 1 ton/ac. (1942).
16. Super. 180 lb./ac.
17. No manure.

It is anticipated that this new type of manurial plot will be much better than the old fenced-in pilot plot, which was difficult to keep grazed in the late spring. The use of treated strips of 11 feet, instead of 3 ft. 9 in. as formerly, is also a decided advantage, as observations are more easily made on wider strips, and manurial responses are not so easily masked by irregularities in pasture growth due to stock droppings, &c.

The present shortage of phosphatic rock renders it essential that the maximum results should be obtained from the supplies available.

It has been claimed that 1 part of magnesium silicate (Serpentine) can be mixed with 3 parts of superphosphate without lowering its effectiveness as a phosphatic fertilizer, and that under certain circumstances this "Serpentine or silico superphosphate" as it is called is superior to the ordinary superphosphate.

In order to verify or disprove the claims made in regard to the value of serpentine superphosphate, a special trial has been established at Ellinbank, and is designed to measure and compare the responses from various forms of phosphatic fertilizer, including Serpentine superphosphate and basic superphosphate, and is arranged so that grazing and mowing are alternated every two years. This involves

An excellent response to superphosphate is well illustrated in this picture.

the layout of two mowing plot enclosures side by side, each treated in a similar fashion as far as manurial treatments are concerned, but one is grazed while the other is mown and vice versa. As an additional precaution against the development of a deficiency in potassium, the whole area is to be given a basal dressing of potash each year.

The treatments under trial are as follow:—

1. No manure.
2. Super. ½ cwt./ac.
3. Serpentine super. ½ cwt./ac.
4. Basic super. ½ cwt./ac.
5. Super. 1 cwt./ac. (every two years).
6. Serpentine super. 1 cwt./ac. (every two years).
7. Super. 2 cwt./ac. (every two years).
8. Serpentine super. 2 cwt./ac. (every two years).
9. Super. 1 cwt./ac.
10. Serpentine super. 1 cwt./ac.
11. Basic super. 1 cwt./ac.
12. Serpentine super. 1 cwt./ac. + carbonate of lime 1 ton/ac. (1942).
13. Super. 1 cwt./ac. + carbonate of lime 1 ton/ac. (1942).
14. Super. 1 cwt./ac. + carbonate of lime 1 ton/ac. (1942) + amm. sulph. 1 cwt./ac.
15. Super. 2 cwt./ac.
16. Serpentine super. 2 cwt./ac.
17. Basic super. 2 cwt./ac.

OBSERVATIONS ON FERTILIZER TRIALS

Phosphatic Fertilizer

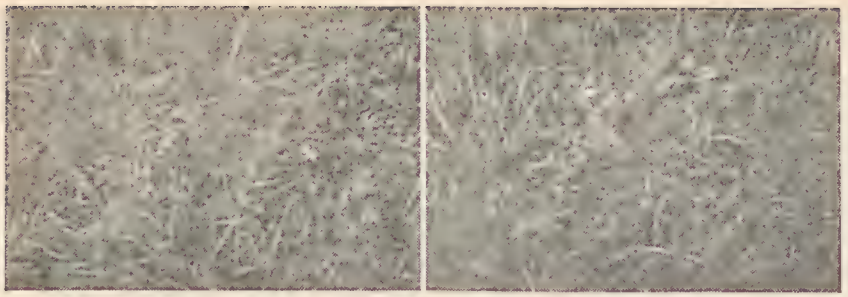
Each year more evidence is forthcoming of the widespread need in Victoria of phosphatic fertilizer in pasture development. Generally, the most satisfactory form of fertilizer to use is superphosphate. The application of this fertilizer usually transforms a pasture by strengthening existing species, encouraging desirable ones, notably the legumes, and improving the platability and food value of the pasture plants.

There are a few localities where the response to superphosphate is relatively poor, due either to high natural fertility or to the need for an application of lime or potash in addition to phosphatic fertilizer, and in this latter circumstance the best results from superphosphate cannot be obtained until the limiting factor is removed.

Apart from these special circumstances, however, one could recommend generally the application of up to 6 cwt. of superphosphate per acre per annum under irrigation, at least two where the rainfall is 25 inches or more, and correspondingly lesser amounts for lower rainfall conditions.

The best time to apply superphosphate is in the early autumn, in order to produce feed for the winter, when it is most needed. Applications made during the winter, although beneficial, are much less efficient in promoting growth at that time of the year, as low temperatures are a limiting factor. Splitting the annual dressing into an autumn and a spring dressing is generally not recommended, but in some cases this is practised to promote an extra growth of herbage in the spring for fodder conservation. In such circumstances one should pay careful attention to the conservation of soil fertility. (This subject is discussed more fully in another section of this report.)

At the present time restricted supplies of phosphates prevents farmers from using superphosphate liberally, but the fertilizer that is



The pasture on right is suffering from a potash deficiency. The same pasture after top-dressing with potassic fertilizer is shown on the left.

available can be used to best advantage if applied at a lower rate to the whole area rather than put on a portion only at the heavier rate.

The effect of superphosphate persists for a long time, and experiments conducted under the V.P.I.L. scheme show that there is a marked residual effect ten years after application. The immediate result of withholding superphosphate is a diminished vigour of the pasture plants, and this results in a lowered production of pasture herbage. As the better types of pasture plants become weaker through lack of fertilizer, other plants capable of flourishing under less fertile conditions assert themselves, and the pasture progressively becomes poorer in its botanical composition.

Pastures on the heavier soils do not deteriorate as rapidly as those on the lighter loams, as in the former case the natural fertility is higher, and even without artificial fertilizer a better type of pasture occurs.

Despite the deterioration in botanical composition that takes place when superphosphate is withheld, it has been noted that if subterranean clover has been well established beforehand it will persist for at least ten years on the residuum of phosphate; so that if it became necessary to withhold superphosphate from improved pastures, it would be a long time before they would reach a condition when they could not be rapidly improved by top-dressing again with superphosphate.

In order to determine whether any economy in the use of phosphatic fertilizer could be achieved by the use of forms of phosphate other than superphosphate, a mowing manurial trial was established at Ellinbank in the spring of 1942. Fertilizers under trial are superphosphate (18 per cent.), serpentine superphosphate, and basic superphosphate in various combinations. No guidance from this trial, however, can be expected until at least a season or two has passed.

Potassic Fertilizers

The first evidence of a pasture suffering from potash deficiency was obtained in the spring of 1932 on the V.P.I.L. mowing manurial trials in the Cobrico and Larpent areas, but, subsequently, numerous instances of potash deficiency both under mowing and grazing have been noted throughout Southern Victoria. From observations made it appears that the reserves of soil potash in the light to medium soils in the better rainfall areas can be exhausted fairly readily, and even first-class soils can become deficient if mismanaged for a sufficient length of time. A stimulation of the growth of pastures or crops by applying superphosphate, coupled with a failure to return to the land the animal excreta produced when the herbage is consumed, is the practice mainly responsible for the development of potash deficiency in this State.

One of the first signs of potash deficiency in a pasture is a diminished growth vigour of species and a deterioration in botanical composition, despite liberal and regular applications of superphosphate. Rye grass gives way to Yorkshire fog, sweet vernal, Danthonia and flatweed, and subterranean clover is replaced by suckling clover. Where the shortage of soil potash is acute, legumes entirely disappear from the pasture, and in consequence the remaining plants may suffer from nitrogen starvation during the winter.

Applications of potassic fertilizer on areas where the soil is deficient in potash will regenerate the pasture, and it appears that to maintain the pasture in a vigorous condition it will be necessary to apply this fertilizer annually in the same manner as one applies superphosphate.

Potassic fertilizers are expensive, and it will be difficult to persuade farmers that it would be economic to use them on grass land. On the other hand, land that is deficient in potash gives a very poor return from applications of superphosphate, and in such circumstances without a potassic fertilizer it might be uneconomic to use superphosphate, or else light dressings only could be justified.

Very satisfactory results have been obtained by using "cement ash," which is a by-product in the manufacture of cement, and its effect has

been more prolonged than dressings of muriate of potash having an equivalent amount of K_2O. Since the war, however, cement ash is no longer available as a fertilizer.

Lime

In contrast to superphosphate, which is needed to develop pastures, lime can be recommended only in a relatively few places. Marked effects have been obtained in Gippsland, notably on the red hill country, in the Kilmore area, and fairly good results at Coldstream, but elsewhere responses have been small or have been entirely negative.

In common with other substances required for the nutrition of plants a shortage of lime can be a limiting factor to growth, and if land needs a dressing of lime one cannot obtain satisfactory results from superphosphate or other fertilizers until this is applied. On the other hand, if pastures respond readily to applications of superphosphate, then it is most unlikely that any substantial benefit will follow an application of lime.

Lime is not a substitute for superphosphate, and cannot be recommended as such, but if land is responsive to lime it is most desirable to use it in order to make the best use of the phosphatic fertilizer applied.

Where lime is needed, all forms seem to be equally effective if applied at rates which provide equal quantities of CaO—100 parts of calcium carbonate are equivalent to 75 parts of slaked lime or 56 parts of burnt lime. In evaluating various brands of lime one should be guided by the cost of a unit of CaO, to which should be added the costs of transport and spreading on the land, which are not inconsiderable.

Time of application is not very important, for usually a season passes before a response occurs. The effect from the first dressing of 1 ton per acre generally persists for eight to ten years.

Conservation of Soil Fertility

An outstanding feature of pasture manurial trials in Victoria has been the demonstration of the widespread deficiency of phosphate in the soil and the fact that with few exceptions the application of a soluble phosphatic fertilizer, such as superphosphate, produces a ready growth response. That a marked and substantial response can be obtained by applying a phosphatic fertilizer indicates that there is a sufficient quantity of the other elements needed for plant growth available in the soil. The shortage of phosphate may therefore be classed as a primary deficiency as distinct from one which might subsequently develop which could be classed as a secondary or induced deficiency.

The making good of a primary deficiency by the use of the appropriate fertilizer permits a stronger growth of herbage, and consequently more plant food is taken up from the soil, and if this herbage is then removed, a large drain is imposed on the various soil minerals. It has already been shown on mowing experimental

A striking illustration of pasture improvement brought about by top-dressing with superphosphate. Note the change in composition of the pasture on left.

plots that a repetition of this exhaustive practice will induce a secondary deficiency in soil potash fairly quickly; but it is the taking away of the herbage that induces the deficiency, not the use of the fertilizer which was applied to make it grow, for if the produce were returned to the soil no secondary deficiency would occur.

The problem therefore resolves itself into how to use the extra growth of herbage produced by top-dressing with superphosphate without exploiting the natural soil fertility.

Under ordinary grazing about 80 to 90 per cent. of the mineral matter in the herbage is returned through the animal excreta, but if the stock are herded at regular intervals, such as occurs with milking cows, less excreta is returned to the grazing paddocks, and the loss of plant mineral becomes correspondingly higher. Some of this excreta is deposited in mustering yards and sheds and is recoverable, but unless special provision is made the urine, which is the most valuable as far as potash is concerned, is lost.

The construction of a farm-yard manure pit for animal excreta, seems to be the most satisfactory method of collecting this material, and it can be subsequently spread over the pastures by using a tank on wheels, with some appropriate form of distributing outlet.

Paddocks that are mown and the produce entirely removed to another part of the farm, or elsewhere, are subjected to the maximum exhaustion, and show signs of potash deficiency in a relatively short space of time. Two harvests of meadow hay from light country at Timboon produced a marked deficiency, whereas rich chocolate land at Callignee was able to withstand the treatment for ten years, after which only a small deficiency of potash developed. The fact remains, however, that even the best soils can become exhausted if soil fertility is not conserved, and it is very desirable that this fact should be made generally known. Ordinarily one thinks of pasture as a builder of soil fertility, and there is no reason why it should not be, but if it is handled like a crop and the produce entirely removed, soil fertility can be depleted comparatively rapidly. Legumes are relatively rich in potash, and for this reason the mismanagement of pasture can induce a deficiency of potash quicker than cropping with a cereal for the same length of time.

OBSERVATIONS ON SPECIES TRIALS

Choice of Species

The best type of pasture is one which contains grass and clover species and only a minimum quantity of weeds. A pasture which has no leguminous plants usually suffers from a shortage of soil nitrogen and consequently lacks vigour. This is most obvious during the winter time, when the pasture plants exhibit a characteristic yellow colour. On the other hand, a pasture made up of all clover, although capable of strong growth and heavy production, is not the best from the nutritional aspect, and can be improved by the inclusion of grass, preferably more than one species.

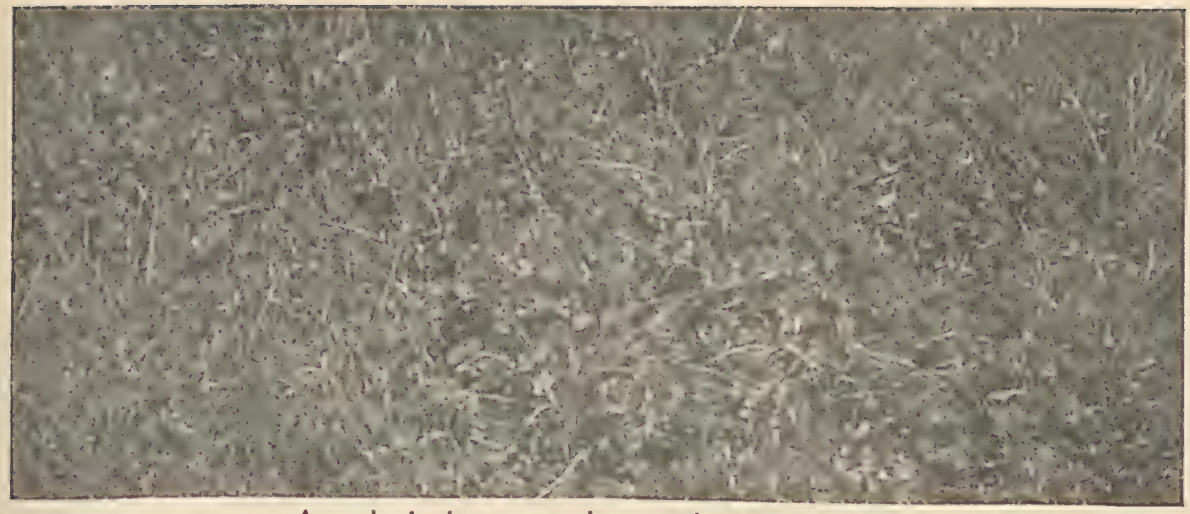
The V.P.I.L. trials have shown that of the various cultivated pasture plants capable of growing under Victorian conditions the most important for pastures are the rye grasses, cocksfoot, phalaris, paspalum, subterranean clover, white clover, strawberry clover, red clover and lucerne, while such species as meadow foxtail, water paspalum, Kikuyu, Poa aquatica, and the birdsfoot trefoils are useful for particular conditions, but not for cultivation on extensive areas.

Under irrigated conditions, or where the annual rainfall is 25 inches or more, all of the above-mentioned species can be grown, but the main ones are perennial rye grass, cocksfoot, subterranean and white clover. Red clover is often sown in mixtures as a temporary element, and its upright habit of growth makes it very suitable for mowing for hay. Lucerne is usually cultivated as a hay plant in the moderate to good rainfall areas. Phalaris, paspalum, meadow foxtail, water paspalum, Poa aquatica, Kikuyu, strawberry clover and the birdsfoot trefoils are capable of growing under poorly-drained conditions, and it appears that in the better rainfall areas are best used for these conditions.

Strawberry clover is more tolerant of soil salinity than most other species.

On the other hand, where the rainfall is less than 25 inches per annum, perennial rye grass, cocksfoot, and white clover are usually short lived, but phalaris and lucerne assume an important role as persistent perennial species, and the annual type of rye grass (Wimmera) and subterranean clover are most valuable pasture plants.

The trial of various strains of pasture species has shown the need for obtaining perennials



A good mixed pasture under natural rainfall conditions.

which are inherently long-lived and productive, and annual types whose period of growth fits in satisfactorily with the distribution of rainfall.

At most centres several strains of subterranean clover have been under test, but at no place has it been shown that an improvement could be effected by replacing the strain which had developed naturally in the district with one of the others. Different strains have a different rhythm of growth, however, and therefore it might possibly be an advantage to establish some paddocks of "early mid-season," "mid-season," and "late maturing" strains of subterranean clover to obtain a greater continuity of feed. The early strain "Dwalganup" is definitely a poor type as far as productivity is concerned, and is much inferior to the "early mid-season" type "Bacchus Marsh."

The sowing of pasture species in various combinations and at various rates has shown that after a few years a fairly uniform pasture develops, and its composition bears little or no relationship to the original rates of seeding but is determined by *climate, soil-fertility,* and *management.*

In developing an improved pasture, therefore, quality of seed is much more important than quantity, and improvement of soil fertility by top-dressing is vital. A thick sowing of an inferior type of plant, or even of the best type, will not compensate for neglect of soil fertility which is all-important in pasture improvement.

It is very obvious that farmers ordinarily sow much more seed than necessary, and it would be more satisfactory if lower rates of seeding were used and the money saved expended on fertilizer.

The accompanying table shows the relationship between rates of seeding and number of viable seeds per square foot using seed of the lowest permissible germinative capacity:—

Seed.	Number of Seeds per Pound.	Minimum Permissible Germination.	Number of Germinable Seeds per Pound.	Germinable Seeds per Square Foot when Sown at the Rate of—			
				1 lb. per Acre.	5 lb. per Acre.	10 lb. per Acre.	20 lb. per Acre.
		%					
Perennial Rye Grass ..	240,000	65	156,000	3·58	17·90	35·80	71·60
Wimmera Rye Grass ..	225,000	65	146,000	3·35	16·75	33·50	67·00
Cocksfoot	500,000	60	300,000	6·89	34·45	68·90	137·80
Phalaris	350,000	55	192,500	4·42	22·10	44·20	88·40
Paspalum	370,000	20	74,000	1·70	8·40	17·00	34·00
Meadow Foxtail	460,000	35	161,000	3·69	18·45	36·90	73·80
Subterranean Clover ..	60,000	70	42,000	0·96	4·80	9·60	19·20
White Clover	670,000	70	469,000	10·77	53·85	107·70	215·40
Red Clover	240,000	75	180,000	4·13	20·65	41·30	82·60
Lucerne	240,000	75	180,000	4·13	20·65	41·30	82·60

From this table it would appear that it should not be necessary to sow more than 5 lb. of seed per acre of any of the pasture plants, and in most cases less than this amount would be quite sufficient even when one allows for a loss of, say, 50 per cent. due to various causes.

Mixtures should be simple, and in most cases two grasses and two clovers are quite sufficient. In choosing species the aim should be to select species that grow during the summer as well as during the cooler part of the year.

While a simple mixture of perennial rye grass and clover might be regarded as satisfactory, where the rainfall exceeds 25 inches per annum, it can be improved by the addition of summer-growing species such as white clover, cocksfoot or paspalum, as these grow later in the season than the rye grass and encourage stock to clean up the mature rye grass, while if sufficient moisture becomes available during the summer they provide an appreciable amount of herbage for grazing. The choice of species will naturally depend on the annual rainfall, for it is of no use introducing species that are incapable of persisting over the summer, or, alternatively, cannot re-establish readily from seed.

Management of Species

The botanical composition of a pasture depends on the relative vigour of its component species, and will change in response to any treatment which strengthens or weakens particular species. Probably the most striking example of this is the transformation that occurs when a pasture is top-dressed with superphosphate. It becomes dominated by leguminous species which formerly were inconspicuous elements in the pasture. The control of weeds generally and particularly species such as fog grass, bent grass, scented vernal grass, &c., is primarily a matter of management, and involves the raising of soil fertility by top-dressing with the appropriate fertilizer and close grazing to encourage legume development. Rest from grazing at certain times will strengthen particular species, and, conversely, heavy grazing will weaken them. The degree and time of defoliation are important factors in determining the botanical composition of a pasture.

On irrigated pastures the rate and frequency of watering have an important effect on the botanical composition. White clover can be encouraged to dominate subterranean clover if the pasture is watered frequently during the summer, and lenient grazing at this time of the year of pastures which are liberally top-dressed encourages a giant form of white clover at the expense of the smaller-leaved forms.

One problem that confronts most farmers is to regulate the proportion of grass to clover in the pastures. Generally speaking, the ratio of clover to grass appears to be too high. In many places in the northern districts pastures are almost 100 per cent. clover, in which case it usually becomes necessary to introduce grass by sowing seed. If, however, there is a reasonable amount of the right species of grass in the pasture, the grass can be strengthened by arranging the grazing during the autumn and spring, so that the stock leave some herbage after grazing instead of eating the foliage down to ground level. On the other hand, some pastures are excessively grassy, and in order to encourage legume development it is necessary to punish them by heavy grazing.

Newly-sown pastures should be leniently grazed during the seeding year. This permits the perennial species to build up a strong root system to carry them through the summer, which is their critical period, and allows the annual species to seed themselves down freely.

Conservation of surplus spring growth at Noorat.

There seems to be no objection to cutting a newly-sown pasture for hay, except the likelihood of depleting essential plant food, and the stubble acts as a protection for the young plants during the hot weather.

Harrowing pastures during the early autumn is generally a beneficial practice, as it is a means of distributing undigested pasture seeds in the dung pats, improving the strike of seed

lying on the ground and reducing the development of rank patches. In districts where soils wash readily with the early autumn rains, harrowing along the contours might be a means of arresting run-off and reducing soil erosion.

On dairy farms an occasional harrowing throughout the year to spread the dung is a sound practice, but generally there does not appear to be any virtue in tearing up the sward, and horse power could be saved in many cases by adapting the harrow so that it would act merely as a dung pulverizer.

Sod-bound swards can be improved by mechanical renovation in the autumn coupled with sowing seed and top-dressing, but ordinary pasture harrows are not suitable for this work.

In the late spring the topping of stemmy pasture growth with a mower induces fresh leafy growth if sufficient soil moisture is available, otherwise this practice cannot be recommended.

The ideal method of utilizing pasture herbage is to conserve surplus food for lean periods, and one has the alternative of making silage or hay. Probably the best procedure is to start early in the spring and make silage until weather conditions permit hay making, when the balance can be conserved as hay. The practice of baling hay has become general, and offers facilities for storage and handling that are not possible with silage, but this form of conserved fodder has a special value in its succulence and indestructibility. There does not appear to be any great difference in the cost of preserving equivalent units of fodder as silage or as hay, provided equal facilities are available for making either.

The practice in Gippsland of saving standing feed in the paddock as a reserve for January and February seems to be unsound, as it serves as an excellent cover for the adult Tasmanian Grass Caterpillar (*Oncopera*) to lay its eggs. These hatch out in the autumn and the caterpillars do great damage to pastures during the late autumn, winter, and early spring.

The remainder of this report dealing with Observations on Salt Reclamation Trials in the Kerang and Cohuna districts, and Observations on Northern Irrigation plots, will appear in a subsequent issue of this Journal.

Baling Wire

Last year, the season in most districts was a bountiful one, providing an excellent opportunity for a much needed conservation of surplus pasture growth as hay. But, farmers and contract hay pressers experienced considerable difficulty in obtaining baling wire for the job.

This difficulty arose partly from transport problems and partly from the enormous demand on raw materials for defence requirements. As a result of representations made by the Department of Agriculture some 500 tons of baling wire was finally released by the Commonwealth Ministry of Munitions for this purpose, and the bulk of this was then allocated to growers.

Growers are warned now of the necessity for the greatest economy in the use of this wire. The position next spring may be even more difficult and farmers are urged to exercise care when removing the wire from the bales, and to so arrange them that they will be conveniently available for use in the coming season.

Prosecutions under the Stock Diseases Act

At the Colac Court of Petty Sessions on 5th May, J. A. Pittman of Colac, was charged under the Stock Diseases Act with having, on 12th April, fed to his 41 pigs unboiled food refuse collected from various eating houses at Colac. The Magistrate, in imposing a fine of £15, said that he viewed the offence seriously because of the danger of spreading infectious diseases such as tuberculosis and swine fever. The recent outbreak of the last-mentioned disease in two States, had been traced to the feeding of unboiled food refuse to pigs.

At the Queenscliff Court of Petty Sessions, P. C. C. Shoppee of Queenscliff and J. Gane of Point Lonsdale, were each fined £2 for similar offences. The number of stock concerned in these cases was small.

Dairy Factory Managers

50th Annual Conference

Opened by
the Minister of Agriculture

THE Fiftieth Annual Conference of the Australian Institute of Dairy Factory Managers and Secretaries, held in Melbourne on 18th, 19th, and 20th May, was officially opened by the Minister of Agriculture, Mr. E. J. Hogan.

Addressing the conference, Mr. Hogan said that national security had been given as the reason for Commonwealth Government interference with industry, and the dairying industry had been subjected to considerable interference. Some people in authority did not realize the sacrifices the dairy farmers and the dairy factory staffs were making.

Despite the transfer of rural labour to the fighting services and to munition factories and Allied works, the dairying industry had been asked to increase production. This had not been accomplished—not because the dairy farmers were going slow, or because of strikes in butter and cheese factories, but because of the scanty summer and autumn rains, shortage of green feed, bran, pollard, and barley, and because of rationing of superphosphate.

Factory butter production in Victoria for the twelve months ending June next, Mr. Hogan added, was estimated at 54,500 tons, compared with 61,550 tons in 1941-42, 68,500 tons in 1940-41, and 72,203 tons in 1939-40. Factory staffs had been depleted by enlistments, and other demands of the Commonwealth. The Dairying Division of the Department of Agriculture had been reduced by diversion of officers to the fighting forces and other war activities. The diversion of so many men directly engaged in maintaining the quality of our butter might have caused a serious reduction in quality. But the dairy farmers, the factory staffs, and inspection personnel had worked well, and the quality of the butter had not deteriorated.

Butter quality should be maintained and with the co-operation of factory managers and dairy farmers, he believed it would. One of the reasons the School of Dairy Technology, Werribee, was created was to help butter factory managers solve their technical problems, and Mr. Hogan urged managers to submit their problems to the Department for investigation at the school.

Dealing with the recent outbreak of typhoid fever at Cheltenham, Mr. Hogan pointed out that the outbreak had been due to a typhoid carrier. It was not possible for dairy farmers or the Department of Agriculture to discover typhoid carriers, nor was it their duty. The recent outbreak at Mansfield Hospital had also been caused by a typhoid carrier—the cook at the hospital.

Sanitary and hygienic conditions at Cheltenham were very bad, Mr. Hogan added. The district was not sewered, and dirty stagnant water was lying in drains which were blocked up with weeds and grass. These defects had not received the attention of the local health inspector, who, however, had inspected dairies outside the Cheltenham district and criticized defects somewhat similar, but not nearly as bad as the defects in Cheltenham itself. "Cast out first the beam out of thine own eye and then shalt thou see clearly to pull out the mote that is in thy brother's eye," quoted the Minister.

Referring again to the dairying districts, Mr. Hogan pointed out that seasonal prospects at present were bad. Hand feeding with consequent heavier demands on the depleted man-power and woman-power of the dairy farms was required to maintain production.

Conservation of fodder supplies next spring would be necessary, but this would not be possible unless some men were released from the services or granted leave to help carry on the industry. Fencing wire should be released by the Commonwealth Government, and the restrictions on the repairing and manufacturing of agricultural machinery removed.

"The dairying industry," Mr. Hogan concluded, "will patriotically and energetically perform its work on the home front if it is given reasonable consideration. I will give it every consideration, and endeavour to induce the Commonwealth Government to do the same."

IRRIGATED LUCERNE and PASTURE COMPETITIONS

Conducted by the Maffra Agricultural Society

Report by the Judge—L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

Irrigated pastures on the farm of Mr. E. J. Pearce, Boisdale.

MAFFRA is an important dairying centre and district farmers have responded well to the demand for more dairy produce. There has been an increased output, although the seasons have not been favourable, and the irrigated farms have been the main sources of supply.

The district is well endowed with good soils —in many years there has been abundant summer rainfall which limited the need for irrigation, and these features explain why, in earlier years, there was some antipathy towards irrigation. Experience of dry seasons over the last few years, however, has emphasized the value of irrigation, and, with improvements in cultural practices, the possibilities of the district have been demonstrated, and there is promise of sustained high production.

The improvements were revealed during the inspections in judging the competitions for the best areas of lucerne and irrigated pastures. During these inspections an analysis of farmers' methods was made, and it was pleasing to note the advances made, and also that the improved practices are on lines recommended in previous competition reports.

The members of the Maffra Agricultural Society who sponsored the competition know what the competitions have done in spreading information, in stimulating further production, and in furthering practices which make for economic husbandry, and conservation and improvement of soil fertility.

The Maffra-Sale irrigation settlements were established later than most of the other irrigation settlements of the State, and consequently the settlers were able to profit from the accumulated experiences of irrigation farmers in other parts. The District Officers of the State Rivers and Water Supply Commission communicated their experiences in the Goulburn Valley, with the result that in most cases farms are well laid out for irrigation. This is noteworthy, because much of the Maffra land is broken by depressions.

Mr. Trevor Harvey's prize lucerne crop.

The basic facts regarding culture of lucerne and irrigated pastures were known early by Maffra settlers, but they were not applied, or at least not to full advantage. The standard of entries in the present competitions shows that there are now many exemplars of approved methods, and indeed the advanced irrigation farmers of the north must look to their laurels.

There is not much need to stress the importance of effective grading and checkbanking of the land to facilitate uniform watering. In this matter there can be no compromise—uniform watering means uniform growth of crops—proper control means saving time and labour and water—it means, too, a reduction of drainage worries. Maffra farmers, however, generally show due regard to this, and indeed the channels and conduits on some farms gave evidence of much work to secure proper distribution in difficult terrain.

A full appreciation of the need for adequate watering has not always been evident, but it is difficult to prescribe what is appropriate watering at Maffra, a district which often has wet summers, but has experienced relatively dry weather over late years. The first substantial rain for years fell in November, 1942, just before the first inspection, and there had been very little more at the time of the second inspection. At Werribee, with an average rainfall of 19 to 20 inches, 2 feet of water during the irrigation season, in addition to rainfall, was required for best growth of both lucerne and pastures, and equivalent amounts are needed in other places. It is true that in parts of Newry wonderful lucerne is grown on non-irrigated ground, but an intelligent application of the principle that sufficient water must be given to promote continuous growth, will help many towards higher production.

In the past, Maffra farmers in general have not been liberal in the use of superphosphate. Because of reduced supplies, they haven't the chance to use more now, but all the prominent competitors have a full appreciation of its value, and undoubtedly it is this which is a main factor in putting them in the prize-winning class, because the maintenance and improvement of soil fertility are of particular importance in irrigated agriculture. Maffra soils are inherently fertile, but they need superphosphate, and growing crops show a good response to its use. Irrigation farmers will be given a supplementary ration of superphosphate. At best it will be below what could be profitably used—no one should neglect to avail himself of his full rights. Any one who disputes the value of superphosphate now will find himself in minor company. The Fertilizer Section of the Department has been beseiged with applications for extra allotments, giving support, if any were needed, to the Departmental teaching of its importance. It can truthfully be said that to irrigate land and not manure it, is misuse of irrigation water.

At Maffra, bloat in cattle is common, and at times it has caused severe losses to farmers. It is generally associated with luxuriant growth of lucerne and clovers, and observant people suggest that the bulkiness of the herbage is not the main consideration, but that vigorously growing plants cause the greater danger—farmers know that superphosphate stimulates clover and they are reluctant to aggravate the trouble, but it has been shown at Maffra that alteration of grazing methods will reduce the danger. When a mixed pasture is grazed hard at frequent intervals, clover will predominate. A few years ago one competitor had his pastures divided into nine paddocks—he moved his dairy herd in rotation, but he moved it every day, and that caused trouble. By extending the rotation period to eighteen days and subsequently to 21 days, he completely altered the composition of his pastures. Grasses, particularly cocksfoot and rye grass, became more

prominent in the pasture mixture. He used more superphosphate, increased production, and has practically eliminated bloat. Through the more lenient grazing practices, production was increased, plants like strawberry clover usually eaten hard by stock were given a chance to progress, and in this particular instance reclaimed "salty" patches, which had been giving great concern to the farmer.

These ideas are not fanciful: they have been supported by progressive men in all irrigation areas. Undoubtedly, well-managed pastures will keep down costs in farm management—pastures imply stock, and the association of the two is of basic importance in irrigation areas. That is one reason why continuous beet growing, for example, is less attractive, because it is exhaustive.

Lucerne Competition

The exhibits of lucerne were praiseworthy—mixed pastures have grown in importance while the acreage of lucerne has declined, but an area of lucerne makes a desirable complement to pastures.

Lucerne is primarily for fodder conservation, and in judging it the design is to appraise it on the quantity and quality of hay it would give at the time of judging. Two inspections were arranged to give farmers a chance to adjust their cutting times, but, unfortunately, many of the stands were seen to disadvantage. That does not detract from the quality of the exhibit of Mr. T. Harvey, Boisdale, the winner of the lucerne competition. At both inspections he showed a beautiful crop—on 3½ acres. The lucerne was sown in May, 1941: seed rate 8 lb. per acre with half a bag of manure. It had been top-dressed since with superphosphate at one bag to the acre. Watering practice is governed by the seasons, but usually the lucerne is watered after every cut.

Mr. C. Lambrecht, the second prize winner, showed 4 acres which he sowed in 1939 on land previously growing beet. In preparation, the land was fallowed and after grading and checkbanking the seed was sown in September, 16 lb. per acre with one bag of superphosphate. The young lucerne was clipped, but one effective cut in the autumn following sowing was made. Mr. Lambrecht repeated the dressing of one bag of superphosphate in 1940 and 1941, but had to reduce it to half a bag per acre in 1942, and early this year and before the second inspection he was able to apply another bag per acre. One watering between cuts is the rule, but frequency of irrigation is governed by the season. Mr. Lambrecht never scarifies lucerne land. In making hay he regularly cocks the hay, "it is the easiest job in the long run," he says.

This competitor's block is on Riverslea, which is the newest part of the settlement.

Illustrating the character of the pasture on the property of Mr. K. Stockel, Nuntin.

He is known as an industrious man, and may be regarded as an examplar of good methods; his production figures after a relatively short occupation are remarkable.

Mr. E. J. Pearce, who was awarded third prize in the Lucerne Competition, is a well-known Boisdale farmer. Although he grows an area of lucerne he maintains that "You can't beat pastures."

Mr. Pearce has a block of 86 acres, which actually maintains 94 head of stock. In pre-irrigation days, his father considered that they were stocked up if they carried 30 head.

In normal times Mr. Pearce used superphosphate liberally—4 cwt. per acre—he now uses one to one and a half bags per acre. He considers that the land needs lime and has tried some, but has had no obvious results.

Comment has been made regarding the excellence of unirrigated lucerne, and Messrs. Hallows, Creighton, and L. Donahoe showed good stands at the first inspection, but the prospectus definitely allotted points for lay-out of land for irrigation. It is suggested that entries be confined to irrigated lucerne, but that the question of a competition for unirrigated lucerne be considered.

Pasture Competition

In the pasture competition, Mr. T. Harvey again was first. He exhibited an area of 7 acres of mixed grasses and clovers which had been down for six years—a good mixture in splended condition.

The mixture was as recommended by the Department of Agriculture. It was given superphosphate, half a bag at sowing, and has had one bag every year since then. The pasture is watered as required, and Mr. Harvey follows no hard and fast rule regarding grazing. When the herd is admitted to the pasture it remains for one week. Mr. Harvey is never troubled with bloat in the cows. The paddock had a slope in two directions—but it was well checkbanked and the channels were clean.

Mr. K. Stockel was second in the pasture competition. He showed an area of 15 acres, which was sown in 1935 on an old beet paddock, and the mixture was perennial rye grass, cocksfoot, white clover, strawberry clover, and subterranean clover, which the competitor includes in all mixtures at the rate of 1 lb. per acre.

The paddock was top-dressed every year with one bag of superphosphate. In 1940 and 1941 it got two bags per acre.

In early years up to 3 acres of this paddock were bare; for the first twelve months it provided only one grazing because it had been subject to repeated exhaustive cropping and flooding and seepage and waterlogging "made it like bitumen," but it has made a most wonderful comeback. Strawberry clover is becoming more and more assertive. "It's wonderful," says Mr. Stockel.

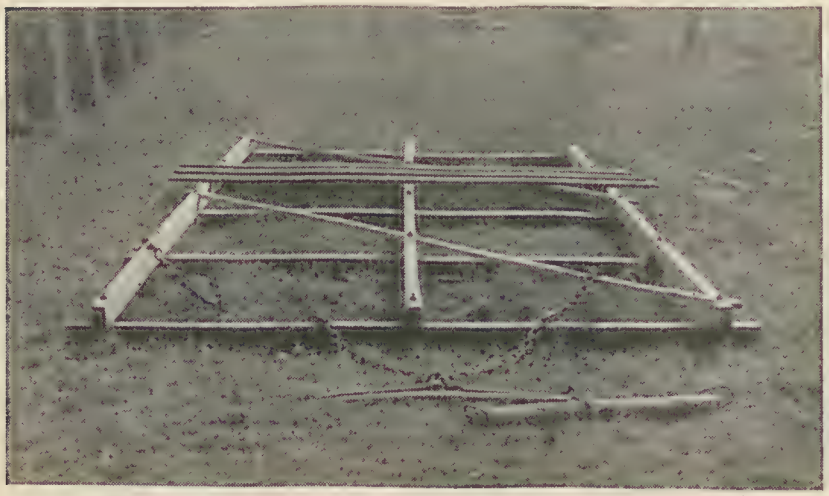
Between inspections this pasture has had a visitation of caterpillars, but it presented an excellent sole of feed with rye grass, cocksfoot, white clover, and strawberry clover, all conspicuous.

Remnants of spring growth detracted somewhat from its appearance for show purposes.

The third prize winner was Mr. Semmens, of "Square Forest," Sale. His exhibit of 4½ acres of pasture had been sown in autumn, 1940

At inspection it was short, despite regular watering and liberal treatment with manure in earlier years, but it was fresh and clean, and its condition really reflected too hard grazing.

This report could be extended to give praise and encouragement to all the competitors. Competition was keen, and some of the entrants may figure more prominently in future competitions.



A simple home-made grader used by Mr. L. Donahoe.

Some were outstanding in irrigation methods, for which a separate competition was held and judged by Mr. H. Hanslow, Commissioner of the State Rivers and Water Supply Commission.

The energetic secretary of the Society is acknowledged as a main spring in the Society's activities. Mr. Dethridge, district officer of the State Rivers and Water Supply Commission, is an ardent supporter of the competitions, and the Water Supply Commission shows its appreciation by providing prizes.

Fodder reserves on the farm of Mr. T. Harvey.

MAFFRA PASTURE COMPETITION, LIST OF AWARDS.

(Average of Two Inspections.)

Name of Competitor.	Layout of Land for Irrigation.	Composition of Pasture.	Condition of of Pastures.	Uniformity of Pasture Sward.	Absence of Weeds.	Total.
	20	20	20	20	20	100
Harvey, T., Boisdale ..	19	19	19	18	19	94
Stockel, K., Nuntin	18	19	18½	18	19	92½
Semmens, W., Sale	18	18½	18	18	19	91½
Creighton, R., Nuntin ..	18½	18	18½	18	18	91
Hallowes, H. J., Newry ..	18	18½	19	17	18	90½
Lambrecht, C., Riverslea ..	18	18	18½	17	18½	90
Higgins, J. C., Somers' Estate	18	18	18	18	18	90
Pearce, E. J., Boisdale ..	18	18	17½	17	18½	89
Bedggood, R., Boisdale ..	18	18	18½	17	17	88½
Gutheridge, R., Boisdale ..	18	17½	16	17	18½	87

MAFFRA LUCERNE COMPETITION, LIST OF AWARDS.

(Average of Two Inspections.)

Name of Competitor.	Layout of Land for Irrigation.	Estimate of Yield at Inspection.	Condition of Crop.	Freedom from Weeds.	Uniformity of Stand.	Total.
	20	20	20	20	20	100
Harvey, T., Boisdale ..	19	20	19	19	19	96
Lambrecht, C., Riverslea ..	18	12½	17½	19	17	84
Pearce, E. J., Boisdale ..	18	12	17½	18½	18	84
Semmens, L., Bushy Park ..	18	9	17½	20	17½	82
Higgins, J. C., Somers' Estate	18	12½	16½	17½	16½	81
Bedggood, R., Boisdale ..	19	5	17	19	19	79
Gutheridge, R., Boisdale ..	18	8	17½	17½	17	78
Non-irrigated.						
Creighton, R.	..	13	17	18	17	..
Hallows, H. J.	..	9	19	19	14½	..
Donahoe, L.	..	9	15½	17	12½	..

Sampling of Milk and Cream

By D. A. LANCASTER, A.F.I.A., L.A.A., Inspecting Officer

THE Babcock method is the one chiefly used in Victorian butter factories for ascertaining the fat content of milk and cream, but other methods may be used if approved by the Dairy Produce Board.

The results obtained by the use of the Babcock method of testing are accepted by the dairying industry throughout the world as being accurate, provided that each step, from taking the sample to the reading of the fat column upon the completion of the test, is correctly performed.

In this article it is proposed to stress the importance of obtaining a representative sample of each supplier's milk or cream, more especially at the present time, because of the high proportion of unskilled labour employed at many factories. It is inevitable that inaccurate sampling will result in inaccurate tests no matter how carefully the other steps in the process are performed.

Sampling Cream for Testing

Regulation 15(*b*), Dairy Produce Regulations 1932, requires that the owner or manager of a creamery or factory shall take, or cause to be taken, in the prescribed manner, samples of all cream received. The cream must be uniformly blended with a plunger stirrer, and the sample drawn with a tube not less than five-eighths of an inch in diameter. The sample must be taken in such a manner as to secure a portion from the top to the bottom of the can, and shall represent the average conditions and specific gravity of the whole. The regulation also requires the owner of the factory to place the sample in a receptacle marked with the name of the supplier, to ensure identification, and closed to prevent evaporation. In any case where the owner is not a tester, the tester shall take or, with the consent of the owner, cause to be taken, in the prescribed manner, samples of all cream received. This is the only approved method of sampling cream in Victoria. In some countries, cream samples are taken by means of a dipper, but this method is inaccurate, especially if the cream is thick or stale.

When taking a cream sample for testing, every precaution must be taken to ensure that it is representative of the whole can of cream, which may contain very thick cream at the top and thin cream at the bottom. In the case of a supplier having more than one can, a separate sample may be taken from each can, and submitted to the tester, or a composite sample, representative of a supplier's total delivery, may be taken. In the event of a composite sample being taken (this is the usual method adopted), great care must be exercised to ensure that it is a truly representative sample by including an aliquot portion of each can. It, perhaps, should be explained that the word "composite" has not quite the same meaning when applied to milk and cream samples in this State. A composite cream sample is one representative of several cans of cream forwarded by a supplier, but comprising only one delivery. Cream samples, of course, must be tested daily. Conversely, a composite milk sample is one that has been built up day by day over the test period, which may extend over a period of sixteen days. (The approval of the Board must be obtained before the test period can be extended from eleven to sixteen days.) To ensure correct sampling of cream, the following precautions should be observed:—

1. Stir each can thoroughly with a metal stirrer of the plunger type.

2. Draw the sample immediately after stirring.

3. Insert the sampler into the can of cream in a manner that will allow a representative sample to be cut from the top to the bottom of the can. (The plunger must not be subjected to a pumping action—top of plunger must be held stationary, and the tube forced from top to bottom of can.)

4. When taking a composite sample from several cans, a separate sample must be taken from each and discharged into a dipper. The cream must be thoroughly mixed and a sample withdrawn from the dipper.

To illustrate the necessity for accurate cream sampling, an investigation of various methods of sampling was undertaken by the American Association of Creamery Butter Manufacturers.

The results obtained showed that an error (depending on the condition of the cream, i.e., thick, thin, lumpy, &c.) of from 0.5 per cent. to 9 per cent. was possible by incorrect and careless sampling.

Care of Cream Samples.

While it is necessary to secure a sample truly representative of the bulk, it is equally important that proper care shall be taken of the sample once it has been obtained. This point has been recognized by the Board, and the interests of the supplier are safeguarded by suitable regulation. The owner of a factory is, therefore, required by regulation to place the sample of cream in a receptacle (sample bottle) marked with the name of the supplier. This is important to ensure identification. The owner of the factory is also required to keep the receptacle corked to prevent evaporation.

These requirements are very important, firstly, to ensure accuracy of the cream tests, and, secondly, from the tester's point of view, because he may, after an interval of 24 hours or more, be required, by an Inspecting Officer, to re-test the sample on hand. When it is necessary to hold samples over night or longer, it is inadvisable, as is often done, to hold them in a warm steamy room. Experiments reported by Hunziker, Mille, and Spitzer conclusively show that cream samples held in loosely sealed jars, and at high temperature, may show an increase in the fat test, amounting to as much as 5 to 10 per cent. in the course of a week. This increase in test is due to evaporation.

The most suitable type of stopper to use in sample bottles is a rubber plug made to fit the standard cream sample bottle. Ordinary corks, because of their cheapness, are most commonly used, but unless they are a good quality, and properly cleaned and sterilized, they become very foul. Unfortunately, they are sometimes found in this condition. Occasionally, cardboard seals, of the type used for milk bottles, are used for sealing cream samples.

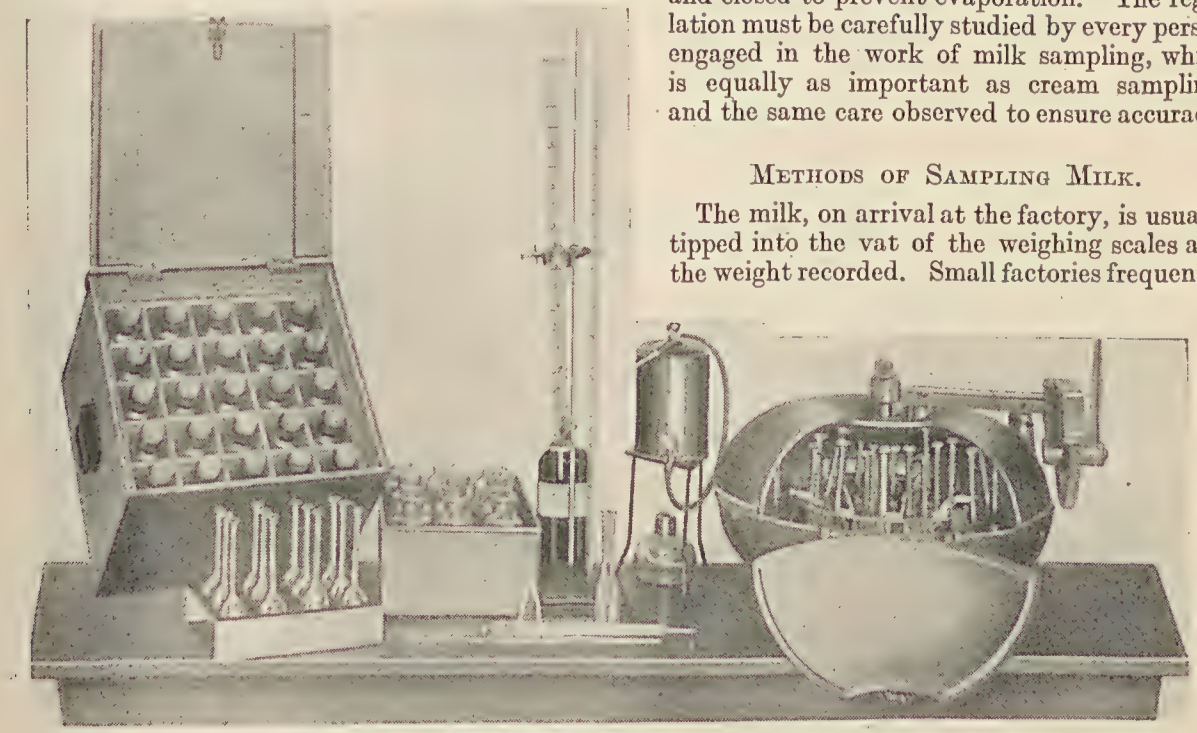
Immediately after use sample bottles should be washed, and all particles of cream removed with a suitable brush. They should then be placed upside down in the racks to dry. It is essential that bottles be dry before use, as even a small amount of water left in a bottle can upset the accuracy of the test.

Sampling Milk for Testing

Regulation 15(*a*), Dairy Produce Regulations 1932, requires that a representative sample of all milk received at a factory or creamery shall be taken by the drip or such other system, as may be approved by the Board. The regulation also requires that the composite sample bottle must be marked with the supplier's name, and closed to prevent evaporation. The regulation must be carefully studied by every person engaged in the work of milk sampling, which is equally as important as cream sampling, and the same care observed to ensure accuracy.

Methods of Sampling Milk.

The milk, on arrival at the factory, is usually tipped into the vat of the weighing scales and the weight recorded. Small factories frequently



The complete outfit necessary to carry out the Babcock test.

weigh each can separately on the scales used for cream weighing. Milk samples are usually taken by the drip, dipper, or sampling tube methods. Where supplier's milk is weighed in tank scales, the sampling tube is probably the most accurate method of sampling for use under commercial conditions, although the dipper method is quite satisfactory. A graduated glass pipette also can be used, the quality of the sample will then have definite relation to the quality of milk delivered, e.g., 1 c.c. to 100 lb. of milk. This is the most accurate method, allowing a truly representative sample to be built up by including an aliquot portion of each day's delivery. The objection to the pipette method of sampling is that it is rather slow to use under commercial conditions.

Care of Milk Samples.

Milk samples are kept for varying periods before being submitted to the tester. In Victoria samples must be submitted to a tester at intervals not exceeding eleven days (if the approval of the Board is obtained the period may now be extended to sixteen days). It is necessary, therefore, to add a preservative to the composite milk sample bottle in order to guard against changes due to fermentation, which would interfere with the accuracy of the test. While there are numerous preservatives that may be used, those most commonly used are formalin, bichromate of potash, and corrosive sublimate. In Victorian factories formalin appears to be the most popular preservative, and is in almost universal use, a few drops being added to each sample bottle before despatch from the test room. Care should be taken not to add too much formalin, because it tends to toughen the casein, and makes the sample difficult to dissolve with sulphuric acid when testing. It has the advantage of not being a violent poison when used in such small quantities.

The rack, in which sample bottles are held during intervals between tests, should be placed close to the milk scales to expedite the work of sampling. The rack must be fitted with a lid, and the bottles kept under lock and key to prevent any attempt at tampering with the samples—this precaution having been proved necessary by experience. Companies may receive milk at a number of creameries, in addition to the central factory, in which case samples are usually conveyed to the main factory for testing. Before samples are despatched from the creamery they should be locked in a suitable container, and on arrival at the factory opened by the factory tester. Separate keys can be kept at the creamery and the factory. The precaution guards against the samples being tampered with while in transit.

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Isolation of Newly-bought Pigs

It is a common practice for farmers to buy apparently healthy pigs in the sale yards, take them home and at once mix them with the other pigs on the farm. It sometimes happens that during the first three weeks or so some of the new pigs develop Infectious Pneumonia—commonly known as Swine Plague. When this occurs the disease almost invariably spreads to other pigs on the farm, sometimes with serious results.

The germ which causes this disease is often present in healthy pigs. When the animal's resistance is lowered, as occurs after transportation and exposure in the sale yards, symptoms often develop.

Only strong healthy looking pigs should be bought and these should be kept in isolation for a period of three weeks. When this is done if disease breaks out it can then be kept confined to the recently purchased animals.

To prevent contamination by drainage the isolation pen or pens should be situated on lower ground than the other pig premises.

On places where pigs are allowed to wander, suitable fencing should be put up to prevent any contact whatsoever with other pigs on the property.

PYRAMID HILL COMPETITIONS

Control of Water—Summer Fodders

By H. HANSLOW, Commissioner, State Rivers and Water Supply Commission

A land grader in operation. More refined methods of land grading with check-banks on the border system have superseded the crude methods of a generation ago.

WHEN Major Mitchell passed through the Pyramid Hill district in 1836, and included it in the area he named "Australia Felix," the land was in its virgin state. Nothing had been taken out of the soil.

In the forties of last century the first graziers stocked the country, and were followed later by the settlers. Everything possible was taken from the soil, and no attempt was made to maintain its fertility. This continued for many years, and it is only of late years that most farmers have realized that the land has been over-taxed, and, if a profitable return is to be obtained from it, some of the lost fertility will have to be replaced.

The grasses and crops have continually extracted from the soil the minerals that they depend on for growth. These minerals have been sent away from the district in wool bales, cream cans, wheat bags, sheep and cattle trucks, and little or nothing has been put back in their place.

The writer, on taking up an irrigation block at Koyuga early in his career, was much impressed, and gained considerable benefit from the following advice given in an American publication on irrigation farming:—

"A farmer only needs a current account in the bank to pay his running expenses. His farm should be his bank. The bank's name is Fertility. He must remember that every time he takes a crop off his land he has drawn a cheque on the Bank of Fertility—be it fat lambs, sheep, wool, cream, wheat, or hay. If he does not put some fertility back into his bank, very soon his account in the Bank of Fertility will be overdrawn."

At one time there was a common impression that the droppings of stock manured the ground well enough, but this disregarded the fact that the lambs and wool produced represented a severe drain. Before the value of top-dressing was demonstrated it was thought that manure was effective only on cultivated land, that it had to be worked into the soil, and if placed on the surface would be dissipated into the atmosphere. Trials, however, have demonstrated the efficacy of top-dressing and the value of more and more liberal manuring.

Approved types of stop and outlet in farm channel.

In the irrigation districts the most successful men are those who grade well, and manure and water adequately.

The country around Pyramid Hill is very flat, with just sufficient fall for drainage. The soils are mostly heavy and shallow, although in some places the land is crab-holey. Generally speaking, however, the contours are good, and the lands are easily flooded with irrigation water, although sometimes difficult to permeate.

Advantage is taken by the farmers of the flat grades to lay out their irrigation lands in the easiest way possible, bays being up to 4 and 5 chains wide and over 40 chains long, with check banks 4 or 5 yards wide. The irrigators' channels are three or four times as wide as the channels in the "one-in-one" irrigation districts, but land values are not high and the areas are large. The check banks and channels grow a lot of winter feed. The channels are big enough to carry sufficient water even if there is a lot of rough vegetation in them. Little attention has been given to controlling the water in the channels other than by the use of mud banks, while there are plenty of swamps and country bearing "rough feed" to turn any surplus water down.

The State Rivers and Water Supply Commission is of opinion that the results obtained by these methods could be greatly improved without the expenditure of much money. To encourage farmers to adopt better methods, prizes of water have been offered for competition.

The Pyramid Hill Agricultural Society has recognized that the district is capable of being greatly improved, and with a view to furthering this object, recently conducted a Pasture Summer Crop and Fodder Competition, and a competition for "The Farm with the best Control of Water both for Irrigation and Drainage."

On the 2nd and 3rd of March last, at the request of the Society, the writer judged the Summer Crop Competition and made the second judging for the farm with the best control of water.

The summer crops were very good, and show that the lands around Pyramid are much better than even most of the owners think they are.

In the Pyramid Hill district the areas are large; the water right is only one in five and is not favourable for growing permanent pastures, because the water cannot be obtained as frequently as is necessary for their successful growth. It is often desirable, therefore, to grow a summer crop. If such a crop is planted at the end of October, after the danger from frost has passed, it will provide green feed until the late autumn and be a wonderful standby in a dry year.

Any surplus water after irrigation should be drained into the swamps, but the swamps should be graded when dry, well "supered", and sown down with paspalum and strawberry clover and wild white clover. Superphosphate for this purpose is not now obtainable, but after the war when it is available this improvement should be carried out. An example of what has been done in this regard may be seen on the property of Mr. J. F. Woods.

An undesirable practice of many Pyramid irrigators is the excessive distance they run water over their crops. In some cases the distances are up to 40 chains, taking 30 hours for the water to run. If this were done in the Rodney district the place would soon become a bed of rushes. Admittedly, water must be held longer on this land than in the Goulburn Valley to get penetration, but 10 chains for subterranean and rye grass pastures and 15 chains for fodder crops should be sufficient.

On these long bays there is danger of water lodging, and farmers hesitate to water subterranean clover early, because of the danger of heavy rain supervening, and hot weather causing scald of the young seedlings. This could be obviated by the adoption of smaller bays.

By grading well, and having narrower bays, it is possible to run a number of bays at a time if the head permits. If not, it is advisable to water only enough bays to permit a good stream on each. By having shorter bays they finish quicker, and it may not be necessary to water the same ground over again.

Eight of the competitors in the Fodder Crop Competition fallowed in the winter, and believed in having a very good tilth in preparation for sowing. Most growers drilled the seed in shallowly and watered to bring it up, although some competitors sowed on top and then watered. One watered and then drilled in the seed. All "strikes" were good, some very good. Of the ten crops entered five were millet, four saccaline, one Sudan grass.

Unfortunately, some of the growers had been forced to stock their crops, which spoilt them for judging, although it was obvious that the crops had been good ones.

The winner was Mr. G. Dickenson, who showed 35 acres of saccaline. The crop was thick and averaged 5 feet in height. Some of it was 6 feet, and it still had a lot of growth in it. The paddock had not had a summer crop in it for ten years, but five years ago had a crop of oats. It was fallowed in July, "One-way disced" in November, and 15 lb. of seed without manure sown very shallowly. It had a light rain soon after, enough to bring the seed through. It was then watered, taking a 3½-inch watering, and has been watered three times since.

Mr. L. Spowart was second. He showed 14 acres of saccaline. This crop was also very good, although not as heavy as the first. It was ploughed in June, harrowed in July, watered at the end of October, scarified, drilled 2 inches deep with 12 lb. of seed and 66 lb. superphosphate, then watered. It has had three waterings, the first taking 5½ inches, and the next 2⅓ inches.

Although neither Mr. F. A. Smith nor Mr. K. Graham were prize winners, owing to their crops being partially eaten down, it was unfortunate for them that the judging had not been done earlier. Both had laid out their places very well. Mr. Smith obtained the maximum number of points for lay-out, while Mr. Graham was only one point behind.

PYRAMID HILL SUMMER FODDER CROP COMPETITION, 1943.

Name.	Layout for Irrigation; Condition of Channels and Drains.	Uniformity of Crops.	Freedom from Weeds.	Productivity.	Total.
Possible Points ..	20	20	10	50	100
1st Dickenson, G. ..	15	15	5	40	75
2nd Spowart, L. ..	15	15	8	35	73
3rd Mills, R. J. ..	10	18	8	34	70
4th Graham, K. ..	19	10	8	32*	69
5th Findlay, M. ..	8	17	8	35	68
6th Smith, F. A. ..	20	18	9	20*	67
6th Jeffery Bros. ..	12	18	7	30	67
7th Broad, A. J. ..	16	15	8	20*	59
8th Shipp, W. ..	8	17	8	25	58
9th Godward, C. ..	8	8	6	25*	47

* These crops were partially eaten off and consequently lost points in productivity.

THE MOST EFFICIENT USE AND CONTROL OF WATER COMPETITION

To make a success of irrigation it is necessary that there should be a sufficient number of water channels. They should be so placed as to command the maximum area possible, and kept free of weeds. To control the water a

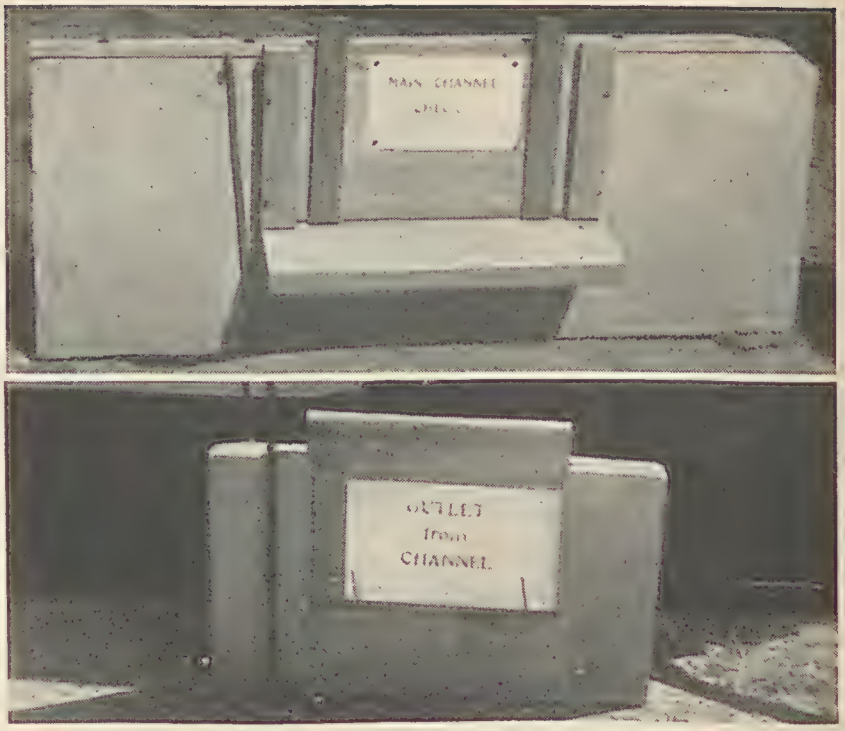
Constructing a "delver bank." In earlier days of irrigation, water was controlled by big delver banks placed at wide intervals.

permanent structure should be placed at the junction of every drain. Permanent irrigation outlets should be every irrigator's aim.

In a drainage district internal drains should be provided to carry away surplus water. Where there is no drainage channel, efforts should be made to take water to some swamp or low area, which should be manured and sown to paspalum, strawberry, and irrigation white clover. Care, however, should be taken not to let paspalum distichum get into the channels.

Good clean water should be provided for the stock.

On an irrigation farm the main thing is correct irrigation. If this is done the results will be excellent, but many a good farm has been spoilt by careless use of water. It is most surprising the number of poor channels there are on farms. The writer has seen farms on which most of the farm was irrigated in getting the water to the far paddock. It is more surprising still that so many irrigators have mud banks in their channels. These are unreliable; they may break at any time, and they generally do so on a windy night. It would be difficult to find harder work than shovelling wet clay. Why do all this hard work, and suffer such annoyances? What is lost in time, work, water, and crops would soon pay for structures to control the water. Land is not highly priced at Pyramid, hence most irrigators have big channels. If the water could be kept out of the channels between waterings the stock would clean the weeds out, and the channels could be so constructed that a mower could be used to clean them. One of the competitors was doing this with some of his channels.



Efficient structures for the control and distribution of water from channels add greatly to the economical use of water.

It will be noted from the scale of points that there is plenty of room for improvement in water control, but Pyramid Hill is not alone in this respect. Poor control is more the rule than the exception in most districts; that is why the Commission subsidized this competition. Mr. Scott, the district officer at Pyramid Hill, has made a number of models of structures suitable for farmers' channels, and he would be pleased to show them and to explain their make to any interested irrigator.

If time and man-power and material will permit, the Commission proposes to make a limited number available at Pyramid Hill office this winter.

Mr. J. F. Wood was the winner of the competition, but there were not sufficient entries for a second prize. The first prize consisted of 10 acre-feet of water and a certificate. Points were allotted as follow:—

Name.	Layout for Irrigation.	Structures.	Cleanliness of Channels and Drains.	Provision for Drainage.	Provision for Watering Stock.	Total Points.
Possible Points ..	30	15	15	25	15	100
Wood, J. F. ..	25	10	12	20	12	79
Malone, L. ..	25	8	10	18	10	71
Broad, A. J. ..	25	5	10	18	10	68
Leed, J.	25	5	10	18	10	68
Wood, C. E. ..	20	5	10	10	10	55

Live Stock Notes

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Slaughter of Calves and Young Cattle

THE prohibition of the slaughter of young cattle is a question that has been considered by the Department of Agriculture on a number of occasions, but measures to *totally* prohibit such slaughter are not considered to be in the best interests of live stock and beef production for the following reasons:—

(1) A large number of unwanted dairy bull calves would have to be reared. These calves would interfere with dairy production, firstly by consuming milk required for other purposes, and, secondly, by consuming feed required by essential dairy cattle. Later, as steers for beef, they would not be worth the cost of rearing.

(2) The culling of diseased, stunted, and unthrifty heifers would cease, and these animals would have to be held until they matured, during which time their beef value would deteriorate. They also would be consuming feed that should be available to the essential stock.

(3) The production of calves (10-11 month-old vealers) would have to be stopped, and, as this is one of the most profitable forms of beef production, great disorganization would occur on the large number of farms used largely for this purpose.

From time to time during the past few years, statements have been made to the effect that the increase in the slaughter of bobby calves, calves, and young cattle must have ruinous effects on the beef and dairying industries, as such slaughter would result in a subsequent shortage of breeding and dairy cows. In spite of what has been said, however, the cattle population of Victoria, with the exception of the 1938 drought year and the year following, has steadily increased.

The cattle population figures, and the slaughterings of bobby calves and young cattle since 1930 are as set out in the table on the following page.

Year.	Cattle Population, Year Ended March.		Slaughterings, Year Ended June.	
	Dairy Cows.	Other Cattle.	Calves (Bobby).	Young Cattle.
1930 ..	619,416	715,826	..	..
1931 ..	669,132	760,788	93,851	32,474
1932 ..	775,538	861,992	120,402	33,052
1933 ..	887,996	1,012,926	131,067	40,195
1934 ..	910,187	1,092,048	147,140	54,638
1935 ..	951,849	1,133,231	201,999	59,294
1936 ..	987,676	1,103,570	310,204	80,272
1937 ..	968,555	1,037,204	393,297	86,950
1938 ..	952,906	927,523	465,951	89,860
1939 ..	889,259	808,036	367,294	81,157
1940 ..	917,051	870,546	330,636	61,746
1941 ..	942,107	932,229	331,675	64,039
1942 ..	954,493	1,032,051	300,349	68,570

The statistics showing the slaughterings of calves (bobby) refer to slaughterings for human consumption only, and do not include those calves destroyed on the farm. When the monetary values of calves fall below certain figures, it does not pay to market them, and the unwanted ones are knocked on the head. It is much better to slaughter unwanted calves for human consumption than to destroy them, and allow the carcasses to go to waste.

As the number of dairy cows in the State exceeds 900,000 head, the total number of bobby calves slaughtered could all be unwanted dairy bull calves, as fully 400,000 dairy bull calves would be dropped each year. Amongst the young cattle slaughtered are all the 10-11 month-old vealers, a number of good well fattened rising two-year-olds and culled stock.

Beef production is being maintained by the heavy slaughtering of cows. It is estimated that 60,000 more cows than normal have been slaughtered this year, and most of these additional cows slaughtered have been good young breeding and dairy cows. It is evident that, because of the increased slaughtering of cows, beef and dairy production must decline next year.

Slaughter of Young Ewes

The slaughter of young ewes between twelve months old and full mouth is not considered by the Department to be sufficiently large as to have any appreciable effect on the production of mutton and lamb. Such young ewes are offered for sale only when the property is overstocked, or when they have been culled. The slaughteryard is the obvious destination of the culls, while the surplus stock are nearly always offered by auction, and are available to farmers requiring them at one bid, usually 1d. or perhaps 3d., above the butchers' prices.

It is considered that the District War Agricultural Committees or other organizations could play an important part by advising farmers who are selling useful young cattle and ewes, to place them amongst other farmers who have the necessary feed and paddock room. The committee members could also encourage farmers intending to buy stock to purchase such animals.

Pigs on New Ground do Best

It has frequently been noticed that when pig keeping is commenced on a new farm, or on a new site on a farm, excellent results are obtained, but after a few years the young pigs are not as thrifty as the first inhabitants of the piggery. They grow more slowly, more of them die, and those that survive do not look so well. There are many reasons for such unthriftiness, including weaknesses in heredity, feeding, housing, sanitation, and management. Even with pigs of the same breeding, and apparently the same environment, the degree of thrift frequently deteriorates. An explanation offered is that the piggery has become "pig sick," a term which is difficult to explain. It may mean that the piggery is frequently impregnated with worm eggs and larvae, and with pathogenic

Pigs reared on the extensive paddock system.

organisms which affect pigs, and whose effect on their thriftiness is more serious when they attack in very large numbers. Observations have shown that removal of pigs to paddocks and yards on a new and clean site generally has excellent results. It is not always practicable to move the piggery to a new site when it becomes desirable, but the following principles in piggery sanitation should be followed in order to keep pigs thrifty, and to prevent waste caused through slow growth, and deaths in young pigs.

Pig paddocks should be large enough for them to be cultivated when such is practicable, and they should be sufficiently numerous to allow rotational grazing and resting for periods of several months. The paddock should be lightly stocked, the youngest pigs should be kept in the cleanest paddocks, and shelter sheds and feeding appliances should be movable, and moved within and between paddocks to prevent the surrounding ground from becoming fouled by a heavy concentration of pigs.

When intensive pens are used, they should be so constructed that the floors and walls can be washed and thoroughly cleaned at frequent intervals. They should be built so that direct sunrays have access to all part of their floors at some time of the day. For this reason, single rows of open-fronted pens facing the north to north-east are recommended.

Proper cleansing of intensive pig pens requires the provision of impervious floors, a complete drainage system, and an ample water supply. In addition, the owner or herdsman must have the time and inclination to clean out the pens frequently.

The piggery should be constructed on the extensive paddock system, or, if that is not possible, on the intensive pen system, since any midway system, such as bare yards, is most unsatisfactory. Bare yards become foodsick quickly and cannot be cleansed.

[L. A. Downey, H.D.A., Pig Expert.]

Sheep Shearing Regulations

Under National Security (Shearing of Sheep) Regulations, stud sheep and flocks of less than 1,000 flock sheep may be shorn at any time. Lambs which are less than six months old are excluded from the definition of "flock sheep." When any sheep are shorn during a period other than the prescribed period, the owner is obliged to furnish to the Deputy Director-General of Man-power, Officer-in-Charge, Shearing Workers' Register, Room 353, T. &. G. Building, 143 Collins-street, Melbourne, a return showing the dates upon which the sheep were shorn.

Use of Local Labour.

The term "Local Labour" is defined as follows:—

> "Local shearers and other shearing labourers who were not engaged in shearing operations outside their own districts in 1941 or later, and who have not made and do not intend to make arrangements to operate outside their own localities this season."

Any sheep owner may conduct his shearing at any time, provided the skilled and unskilled labour necessary for the work is carried out by his permanent employees or with the help of neighbouring sheep owners and their permanent employees, and providing he is the owner of the sheep to be shorn, and that his flock is depastured on the property of which he is the owner or occupier.

Any sheep owner with more than one thousand (1,000) grown flock sheep who intends to use any form of "local labour" to conduct his shearing during the prohibited period, must make application and obtain a permit to so do from the Deputy Director-General of Man-power at least 28 days before his intended starting date of shearing. In making the application a full and detailed list must accompany the application, setting out the names, present addresses, and full identity card number of each person to be engaged.

Identity Cards.

A condition precedent to employment is that an applicant for employment must produce his identity card for inspection by his employer, and the number of the card to be carefully recorded in order that same can be inserted in the 1943 shearing form. If any person proposed for employment is unable to produce an identity card, the fact must be reported within three days to the National Service Officer in the area in which the employer is located.

Releases from the Services.

In this regard the Certificate of Release from the Defence Forces must be examined and noted or the leave pass of the person concerned closely scrutinized to see that such leave pass

covers the proposed period of employment. If a certificate of release or a leave pass as indicated cannot be produced, the circumstances must be reported to the National Service Officer, as in the case of a proposed employee not being able to produce an identity card.

Sheep, Calf, and Pig Crates

The construction of crates to dispatch individual animals by rail and road transport is a relatively simple matter. Specifications with plans for constructing a sheep crate are shown in the accompanying illustration.

The crates need to be wide enough to just comfortably accommodate the animal. If the crates are too wide, the animals try to turn round, placing an unnecessary strain on both the crates and themselves. If the crates are too small the animals will be rubbed. Large crates are unnecessarily heavy.

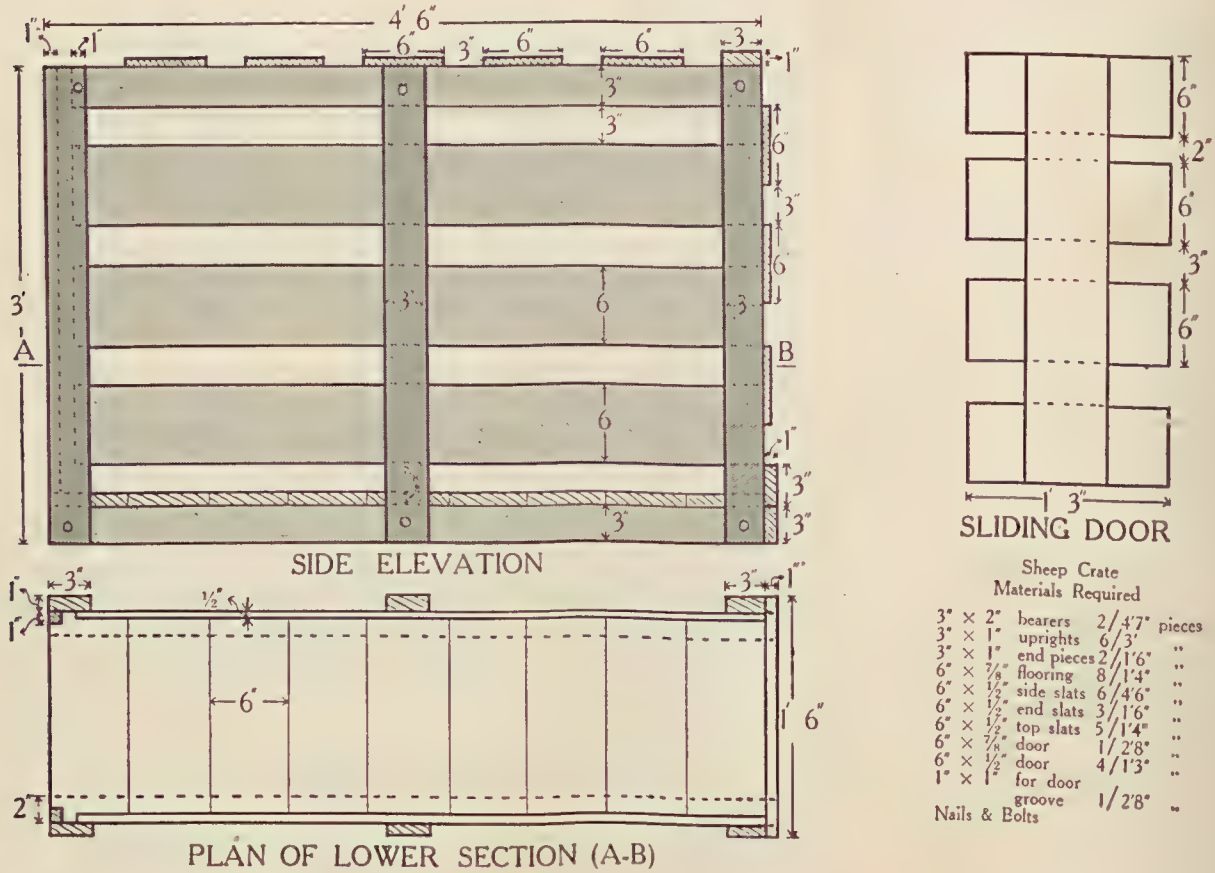
The side boards should be nailed on the inside of the uprights so that they cannot be pushed off as most of the strain is on the sides.

Before dispatching, the sliding door should be securely fastened to prevent it being lifted up (and open) when the crate is being handled.

It is important that all crates be clearly labelled to ensure against any delays in transit.

The same crate may be built to hold calves and pigs as well as sheep. Wherever possible, it is desirable to construct crates just large enough for the type of animal being dispatched.

It must be borne in mind that calves are much higher in proportion to their length than sheep, and crates being built for calves must be made at least 9 inches higher than the sheep crate illustrated. Crates to hold calves up to about four months old should be made 4 ft. 7 in. long, 3 ft. 9 in. high, and 1 ft. 6 in. wide. Such crates would also hold sheep and pigs. For calves six months old, a crate 6 ft. long, 4 ft. 6 in. high, and 1 ft. 9 in. wide may be required. The gross weight of a calf in such a crate will be about 5½ cwt., and this is about the weight limit that can be handled.



Sheep Crate
Materials Required

3" × 2"	bearers	2/4'7"	pieces
3" × 1"	uprights	6/3'	"
3" × 1"	end pieces	2/1'6"	"
6" × ⅞"	flooring	8/1'4"	"
6" × ½"	side slats	6/4'6"	"
6" × ½"	end slats	3/1'6"	"
6" × ½"	top slats	5/1'4"	"
6" × ⅞"	door	1/2'8"	"
6" × ½"	door	4/1'3"	"
1" × 1"	for door groove	1/2'8"	"
Nails & Bolts			

Plans and specifications for construction of a sheep crate.

The harbouring of any personnel from the Services, absent without leave, is a serious offence, and one is liable to very severe penalties and punishment for so doing.

In recording Service personnel in the shearing form to be completed, full details must be given, setting out the regimental number, rank, name, and unit of the person concerned.

These conditions apply to all shearing sheds, irrespective of the number of sheep shorn.

Shearing contractors must also make out a new form for every shed they conduct.

Inspection of Stallions

Under the provisions of the Horse Breeding Act, arrangements for inspection of stallions for the coming season are being made at centres most convenient to applicants. Owners of stallions and two-year-old colts should bear in mind that each animal presented for examination must be well groomed and thoroughly handled in order to facilitate the examination by the visiting veterinary officer.

The examinations are for conformation and the following unsoundnesses:—Bog Spavin, Bone Spavin, Chorea, Curb, Cataract, Ringbone, Sidebone, Stringhalt, Thoroughpin.

Each animal should be taught to lead, wheel, back, and have his feet handled and picked up. Also, he should be used to having his head and mouth handled.

The applications for registration, accompanied by the necessary fees, must reach the Chief Veterinary Inspector by 30th June next, and owners will be advised of the date, time, and place of examination.

The fees payable are £1 for two-year-old colts, £3 for stallions fifteen years old and under, and £1 1s. for stallions sixteen years old and over.

[G. Nicol, B.V.Sc., Veterinary Officer.]

Poultry

For many years it has been the practice of poultry keepers to hatch chickens during the months of July, August, and September. During these months the breeding stock possess the maximum vigour required to produce the best progeny. It is essential for the breeding stock to be of good size, which is an indication of healthy development, but they should not be too large or coarse. Eggs for incubation should be carefully selected for size, shape, and texture of shell.

It is important that chickens should be kept under strictly sanitary conditions. Failure to do so may result in the loss of many chickens each year. Fresh air, direct sunlight, ample room, and ease of cleaning the rearing quarters are also important requirements.

Chickens must not be left in the warm brooder too long. They should be transferred gradually to clean, open-range conditions, and given every care.

Chickens must be fed well on nutritious foods right from the commencement. There are many commercially mixed and other rations and feeding systems used by poultry farmers, and, if good results are obtained, there is no reason to change, but any of the following mash mixtures, with cracked grain, greenstuff, and fine shell grit will give good results:—

—	Mixture 1.	Mixture 2.	Mixture 3.
	lb.	lb.	lb.
Ground wheat ..	40	30	50
Ground hulled oats	20	10	30
Ground maize ..	20	40	..
Bran	10	10	10
Dried buttermilk	10	5	..
Meatmeal ..	..	5	10
Common salt ..	½	½	½

The above mixtures can be given as a dry or wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash twice a day. It can be fed from the first feed, when the chicks are about a day old, until they reach maturity, or until they are well grown, and then fed on an adult ration. Portion of the ground wheat and ground oats may be substituted with ground barley.

For the grain portion of the ration, 60 lb. of cracked wheat, 20 lb. of cracked hulled oats, and 20 lb. of cracked maize, make a good mixture. Only a small amount of grain is usually fed at first, and the quantity gradually increased. After the chickens are about eight weeks old, coarser grain or whole wheat may be fed.

It is important that the chickens should receive as much tender green food as they can eat at least once a day. Fine shell-grit should be available in separate hoppers. A liberal supply of fresh and clean drinking water always should be at hand.

Suitable food and water vessels should be provided, to keep the food clean and prevent waste, and they should be placed in positions

where the chickens cannot walk into them. The vessels should be regularly emptied and cleaned.

[H. F. Clinton, Poultry Expert.]

Bees

The interior of the hive should not be disturbed during June. Except during the few hours of bright sunshine, when bees may take a cleansing flight, there will be little activity. With the approach of cold weather, the bees form a compact cluster for warmth to counteract cold spells. Honey is consumed to generate heat, keeping the interior of the hive at an even temperature, and if the hive is opened during cold weather, the inside temperature will fall, causing the bees to consume more honey to again raise the temperature of the hive to normal. This creates an unnecessary drain on the winter stores.

Grass should not be allowed to remain at the hive entrance, as bees returning are likely to become chilled on contact with cold damp grass, and may fail to enter the hive. Strong winds and stock, having access to the apiary, often displace hive covers, thus exposing the colony to the full stress of the cold weather. This should be guarded against by a frequent observation and immediate replacement of the covers.

Where bees are not kept on the property at the permanent address of the owner, it is now necessary to have the name and permanent address of the owner on each hive. A regulation to this effect came into force on the 1st of June. This step has been found necessary to assist in the effective control of disease, and maintenance of the present low percentage of infection. It should be apparent to those with the interests of the industry at heart, that a ready means of identification of all hives in a certain locality on a given date should be available. With the aid of a stencil plate, costing a few shillings, a brush, and stencilling paint, the name and address of the owner could be stencilled on 150 hives in an hour.

[J. W. Thomlinson, Apiary Inspector.]

Potato "Seed" Selection

There is no reason why any good variety of potato should not remain in cultivation as long as growers remain to cultivate it. Once a grower secures a variety that suits his local conditions, he should so treat it that rather than "run out" it will tend to improve as time goes on.

The length of time any particular kind of potato remains in profitable cultivation is governed by two things, namely, the treatment it receives, and its vigour at the time of introduction.

Some varieties are more vigorous than others when produced from the seed-berry of the potato plant, and consequently can stand more adverse treatment before falling into a condition of low productiveness, than can those of less vigour. But no matter how vigorous any variety may be, it cannot withstand the degenerative influence of bad or unselected seed.

When seed of poor condition is employed to grow any crop, that crop is so handicapped that its finish will be disappointing. A very large proportion of the crops grown in Victoria start with seed of impaired vitality.

Ordinarily potatoes are allowed to ripen in the ground before being dug, and the seed for the following season is selected either from the crop after it has been bulked, or from the rejects from the marketable tubers. After this the seed is generally stored in any place where it can be conveniently disposed of, in heaps, bagged or pitted, and is often forgotten until required for sowing. The result is the formation by seeding time of a mass of long, delicate, white shoots, which in most cases are carefully and deliberately removed by the growers. The object of breaking them off, of course, is to prevent the irregular appearance of the crop above the ground, and with such an object in view, the practice of desprouting serves its purpose, but the seed suffers.

Internal Parasites of Poultry

By HAROLD E. ALBISTON, D.V.Sc.,
Director, Veterinary Research Institute, University of Melbourne

UNDER natural conditions, parasites live in a state of comparative harmony with their hosts, without producing any marked deterioration in health, as by so doing their very source of existence would be endangered. When artificial conditions are created, however, the relation between host and parasite becomes altered; the parasite ceases to be a comparativly harmless companion, and parasitic diseases frequently result.

It is unusual for domestic poultry to be kept under natural conditions, and with the greater concentration of individuals and overcrowding, there has been a corresponding increase in the incidence and importance of parasitic disease. That is, the intensive system of poultry raising, which appears to be necessary for the commercial success of the industry, provides ideal conditions for the development of the parasites of the domestic fowl, unless preventive measures are undertaken.

The extent to which worms may produce sickness or mortality in poultry depends on the number of parasites present, the age of the hosts concerned, and the individual characteristics of the infesting worms.

All intestinal worms are compelled to pass some phase of their life history outside the bodies of their hosts, either as eggs on the ground or as stages in intermediate hosts. Further, worms do not multiply in the bodies of their hosts, and in this respect verminous diseases differ markedly from contagious diseases, such as pullorum disease and fowl pox.

There are a number of important parasites of fowls which so far have not been found in Australia, and only those which are commonly encountered in this country will be described.

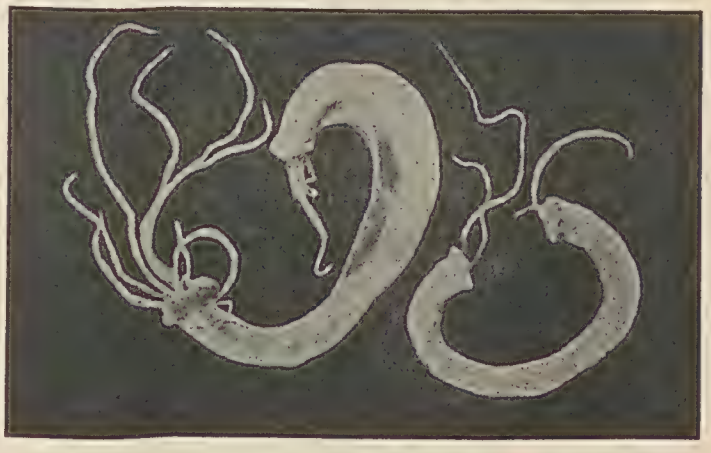
The Common Round Worm (*Ascaridia galli*).

The common round worm of poultry is a large yellowish-white worm measuring from 1½ to 4 inches long. The adult worms are found in the small intestine of fowls and turkeys, where the mature female worm deposits its eggs, which are then passed in the droppings. Infection is direct, there being no intermediate host necessary. Outside the body the eggs undergo changes in development, resulting in the formation of an embyro or larva within the egg. The larvae may remain dormant for long periods, but when the eggs find their way to the digestive tract of a suitable host, hatching takes place in the duodenum, and after ten days or so, the larvae bore into the wall of the intestine, where further development occurs. A week later, the larvae re-enter the bowel and develop into mature worms in from three to four weeks or sometimes longer.

It has been found that chickens fed adequately, and kept free from these parasites until twelve weeks of age, develop a resistance to infestation with *Ascaridia*, so that only a few worms are able to mature. When young growing chickens become infested, however, they show more or less serious symptoms, depending on their age and the degree of infestation. Chickens under two months of age are seriously affected, and there may be a high mortality rate.

The Hair Worm (*Capillaria columbae*)

The abovementioned worm belongs to the "whip-worm" family. They inhabit the small



Round Worms protruding from the intestine of a fowl.

intestine of fowls, and because of their extremely fine and hair-like appearance, they are likely to be overlooked during a postmortem examination. The life history is direct, and is similar to that of *Ascaridia*. When sufficiently numerous, they may be responsible for serious ill effects.

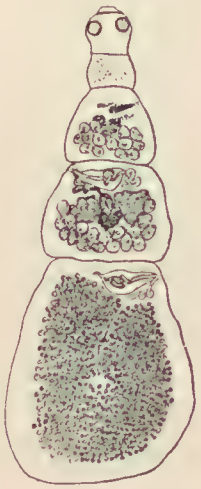
The Caecal Worm (*Heterakis gallinae*)

The caecal (blind gut) worm is a small white worm about half an inch in length. It is the commonest parasite of the domestic hen, and is found in over 80 per cent. of all fowls. The main significance of this parasite lies in the fact that it acts as an intermediate host of *Histomonas meleagris*, the cause of entero-hepatitis or "blackhead."

The life history is direct, and generally similar to *Ascaridia*, except that it takes eight weeks for the egg to become infective.

Tapeworms

Tapeworms are ribbon-shaped worms, consisting of a head at the anterior extremity which is provided with suckers and sometimes with hooklets for attachment to the lining membrane of the bowel, and a body composed of segments, each segment being a sexually complete individual. The oldest segments are those farthest away from the head. The fully-developed segments containing fertilized eggs are detached from the main body of the worm and are passed in the droppings, where the eggs are liberated by the disintegration of the mature segments.



Davainca proglottina. Complete specimen (enlarged).

All tapeworms require at least two hosts for the completion of their complicated life cycle. In one of these hosts they pass the immature or larval stages, and in the other they become adult and sexually mature.

Davainea proglottina is the smallest tapeworm encountered in the fowl, being so minute as to escape notice unless looked for very carefully. It has from four to nine segments, and occurs in the duodenum. Its intermediate stages are passed in slugs.

Amoebotaenia sphenoides.—This tapeworm measures up to half an inch in length, with about twenty segments. It is found in the small intestine of fowls, and the intermediate stage is passed in earthworms.

Choanotaenia infundibulum is a fairly long tapeworm, the maximum length being 8 inches, with a large number of segments. It inhabits the small intestine. The usual intermediate host is the house fly, though a species of dung beetle has been successfully infected with the intermediate stage.

Symptoms.

The symptoms presented by worm-infested fowls are by no means characteristic, and the detection of verminous disease is therefore impracticable merely by the signs exhibited by live birds.

A reduced or capricious appetite, loss of condition, diarrhoea, and pallor of the comb and wattles may be observed. Heavy infestations with *Capillaria* are frequently seen in Victoria during the autumn, and effected birds may show marked listlessness and a darkened comb.

Birds suffering from a heavy infestation with tapeworms frequently exhibit varying degrees of leg weakness.

Control.

In the control of worm infestation of poultry, more reliance should be placed on systematic sanitary measures than on drug treatment. *Ascaridia* infestations can be successfully treated with carbon tetrachloride, or nicotine sulphate, but the effect of these drugs on *Capillaria* is doubtful, while tapeworms have proved resistant to drug treatment.

The control of parasitic diseases depends on the reduction of the chance of re-infestation by the regular removal and proper disposal of the droppings and litter from the houses.

Chickens should be kept in the brooder until twelve weeks old, and fed with a diet adequate for growth and development. Lack of vitamins predisposes to infestation. The ground on which the brooder is placed should never be used for adult stock, and after the chickens have been transferred to pens, the ground should be heavily dressed with ground quicklime which, after being allowed to act sufficiently, is then dug in.

Screened manure pits should be used where possible, and the litter and droppings removed

from pens regularly. Poultry manure should not be used to fertilize crops grown to supply green feed to birds. Where this is done, slugs and earthworms become infested with the intermediate stages of tapeworms from the eggs in the droppings, and when the crop is cut and fed to the fowls, it is inevitable that some infested worms and slugs will be included in the green feed.

Medicinal treatment for tapeworms is quite unsatisfactory. Many drugs have been recommended from time to time, but none can be recommended. Until some drug is found which will definitely remove tapeworms from poultry, control measures based on improved sanitation, and the interruption of the life cycle of the parasites must be relied on to reduce the incidence of these helminths.

An Easy Method of De-horning

It is well known that polled or de-horned cattle can be managed with greater facility than horned animals.

The practice of de-horning cattle by the use of the saw or the de-horning machine after the horns are fully grown appears to inflict great pain upon the animals. It is therefore desirable to draw the attention of stock owners to a method of preventing the growth of horns by the application of caustic potash to the horn buds of young calves. If performed with proper precautions it is comparatively painless and can be done quickly and with ease. The calf should be treated when between the age of two and seven days, the hair being clipped off around the horn bud and a coating of vaseline applied to the surrounding skin to prevent injury from the caustic. Caustic potash, which is the preparation generally used, may be obtained in the form of rods or pencils from any chemist, and should be wrapped round with tough paper to protect the operator's fingers. The horn bud should be lightly rubbed with a piece of fine sandpaper till the surface becomes moist but not bleeding. Then rub the horn with the caustic, taking care that the whole surface has been treated. This should be repeated two or three times at intervals of a few minutes till blood appears in the centre of the horn. If done thoroughly the growth of horn will be prevented and the animal will suffer hardly any inconvenience.

After applying the caustic take care that the calf is not exposed to rain for a day or two, as the caustic may run down the face and injure the skin. After using the caustic stick wipe any moisture off it and keep it in a well-corked wide-mouthed bottle. Otherwise it will absorb moisture from the air and melt away. In cases of burning of the skin by caustic potash, immediately apply a weak solution of vinegar and water to the injured part.

Drenching of Sheep and Lambs

Before administering a drench to sheep or lambs be sure that the dose is correct for the age of the animals being drenched.

Special drenching horns which hold the correct dose may be used.

There are various drenching guns on the market, most of which are satisfactory.

To prevent injury to the membranes of the mouth when using these, it is a good idea to slip a piece of rubber tubing over the nozzle allowing it to project slightly over the point.

The sheep should be drenched standing on all four feet with the nose held about level with the eyes.

Hold the head in position with one hand with the four fingers under the lower jaw and the thumb over the nose. The jaws should not be gripped tightly. The drenching gun or horn should be passed through the side of the animal's mouth, over the tongue and between the back teeth and the dose poured or injected slowly.

The head should be lowered immediately if the sheep begins to cough.

IN THE ORCHARD

Contributed by the Horticultural Division

Lemon Growing in Southern Victoria

THE cultivation of lemons in districts adjacent to Melbourne has proved a profitable adjunct to the main activities of deciduous fruit-growing. New plantations are continually being established, but seasons of over-supply are rare, chiefly because of the decline of old trees. Reasons for this decline include development of root troubles due to bad drainage, collar rot, the use of unsatisfactory rootstocks and attacks by the citrus borer, or elephant beetle, which causes damage to trees usually low in vigour through some other cause.

The soil of the area consists of a grey clay loam, which varies in depth from 6 to 12 inches, overlying a whitish sandy loam. The subsoil consists of heavy yellow clay derived from decomposed silurian bedrock. The depth of soil varies considerably and is fairly shallow in the Templestowe-Doncaster area, but is deeper in the Ringwood, Blackburn, and Burwood districts. The soil is not ideal for lemon growing, and care must be exercised in selecting a site suitable for a plantation so that wet situations are avoided. The installation of tile drains, which are set just on top of the clay layer, is an insurance against loss of trees through waterlogging.

A healthy Lisbon lemon tree, forty years old.

One reason for the success of lemon growing in the south of Victoria is the absence of severe frosts which in inland areas cause the loss of the profitable summer crop of lemons. The heaviest blossoming, in September and October, produces the winter crop. The January-February blossoming, which produces the crop maturing in the following summer, is lighter than the main crop, and the young developing fruits are susceptible to frosts occurring during the winter. It is important, therefore, in selecting a site for a plantation, to avoid likely frost pockets. The tops of ridges are preferred to low-lying situations where frosts are likely to be severe. Some growers have installed heaters using briquettes or oil, and alarm thermometers, in order to protect the trees from damage. To be effective, about 50 heating units per acre are required. Young trees may be planted any time during the period April-September. Planting in the spring is probably the best time because, by the time growth has commenced, frost damage is less likely. Ball rooted trees may be planted straight into the soil, but the roots and tops of bare-rooted trees should be cut back severely before planting.

Varieties.

The main variety grown is the Lisbon of the type known as "Doncaster improved." As many growers raise their own trees, bud selection is practised extensively. Buds have been obtained from heavy-bearing trees of good type, and by this method of selection the Doncaster improved Lisbon has been evolved. It has less thorns than the original Lisbon. Eureka is also grown, but not to the same extent.

Pruning.

Lemon trees do not require the same amount of pruning as deciduous fruit trees. However, they should not be allowed to grow uncontrolled, because there is always a tendency for upright growing shoots to develop rapidly in the centre of the tree to the detriment of the more fruitful laterals growing horizontally. Such shoots should be removed entirely. A thinning out of the growth on mature trees will result in the renewal of bearing shoots.

Rootstocks.

The *citronelle* or *rough lemon* results in a fast-growing tree, which tends to bear coarse fruit during its first few years of growth. Trees on this rootstock are not long-lived, and it is not well suited to the shallow soils in this area.

The *sweet orange* has been used extensively as a rootstock, but has not proved entirely satisfactory. It produces a big tree which bears well, but is said to be susceptible to collar rot.

The most satisfactory stock appears to be the *Seville* or *sour orange*. This is best adapted to the prevailing soil conditions, and produces a long-lived tree.

Citrus trifoliata has also been used, but it has a dwarfing effect and closer planting—12 to 14 feet, instead of the usual 20 to 22 feet, is advisable. Trees on this stock bear heavily for their size, and the quality of the fruit is good.

Manuring.

On all citrus groves, growers realize the value of maintaining a high level of soil fertility. For this reason, liberal applications of poultry or stable manure are given each year, together with a spring dressing of up to 4 lb. per tree of sulphate of ammonia or nitrate of soda. Blood manure, and blood and bone fertilizers are also used extensively when available. With possible shortages of these artificial fertilizers, the use of green crops in the lemon grove can be soundly recommended. A crop of tick beans, field peas, tares or lupins planted in March and ploughed under in August will add considerably to the soil nitrogen and increase the humus content of the soil, a desirable feature for the healthy growth of lemon trees.

Wind Breaks.

Protection of the plantation from wind will result in higher quality fruit, free from rind blemishes. *Pinus radiata* has been used extensively, and *Cupressus Lambertiana horizontalis*, planted 8 to 10 feet apart, also provides a rapidly growing shelter belt.

Irrigation and Cultivation.

For full production, trees require water during the summer, and the usual source is the metropolitan water supply, although some growers are able to use a limited amount of water from catchment dams. Because of the shallowness of the soils, a watering is given every ten to fourteen days. The method usually adopted is to treat each tree individually by allowing the water to run around it from a furrow or a pipe.

Ploughing during the early spring followed by disc cultivation or harrowing is necessary for weed control. Hand hoeing around each tree may be necessary in full-grown groves, because of the danger of damaging the trees by using implements.

Parasites.

The scale insects, including red scale, olive scale, and flat brown scale, are fairly easy to control by the use of white oil used at a strength of 1 gallon to 40 of water. Usually one spray applied between January and April is sufficient to control these insects, although another spray in November may be necessary. Control of scale insects will also result in control of sooty mould. Bordeaux mixture of strength 3:3:50 should be applied in the early winter for the control of anthracnose or septoria fungous diseases which cause spotting of the fruit.

Yields and Markets.

For a healthy grove in full bearing, yields of six to eight cases per tree may be expected each year. No figures are available for the average yield, but it is probably in the vicinity of two to three cases per tree. The bulk of the fruit reaches the Melbourne market, where growers do their own selling. Small quantities are also exported to other States, and New Zealand.

[By W. A. Rolfe, Orchard Supervisor, and G. W. Gayford, B.Agr.Sc., Assistant Horticultural Research Officer.]

Make Your Money Fight—

Buy War Savings Certificates

and Government Bonds.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

TIDYING-UP, pruning, and winter digging are the most important operations in the garden this month. When leaves and light prunings are collected, either bury them, or add them to the compost heap. Another good practice is to dig them under, spreading a light application of bone dust over them.

Remember that the phosphatic fertilizers, such as bone dust and superphosphate should be placed deeply in the soil because they do not move readily through the soil like nitrogen, potash, lime, &c.

At the present time when fertilizers are difficult to obtain, it would be advisable to collect leaves and other rubbish from the flower garden and dig it under in the vegetable garden with an application of fertilizer suggested above. Organic matter (leaves, prunings, &c.) is so difficult to obtain and so necessary in all our soils, that none of it should be burnt.

Herbaceous Perennials

The herbaceous perennials should be cut back to the ground as soon as the tops have commenced to die. Do not immediately commence lifting and dividing these plants. It is much better to delay lifting and dividing until the early spring when growth is just starting. The growing plant soon heals any wounds, whereas the dormant plant may become infected by fungous diseases entering through unhealed wounds caused in winter.

Pruning

Pruning is too difficult and comprehensive a subject to deal with in notes of this kind, but a few rules and practices will assist the beginner who may have to do this work for the first time this year. Remember first that all pruning is a dwarfing process—summer pruning more so than winter pruning. The pruner is striving to keep the plant in bounds which nature never recognizes.

In rose pruning, the main objects are to produce new growths, on which the roses are carried, and to give each of these new growths sufficient space for strong healthy development, and to so place them in position that a symmetrical plant of the desired height is obtained. If too many shoots are allowed to develop, or they are too crowded, the growths will be weak and the roses small and poorly formed. To commence pruning, remove all dead and diseased wood, as well as small, weak growths. Immature wood, which was produced late in the autumn should be removed entirely, or, if strong enough for use as a part of the framework, it should be left unpruned. If one side of the rose-bush is weak, prune that side lightly, i.e., leave the growths longer than on the strong side. Hard cutting of weak growths will not strengthen them. Encourage lateral spread by pruning to buds facing away from the centre of the plant.

On older plants, some central shoots can be cut back to produce some inside growths, but care is necessary to see that these do not become too crowded. As a general rule when cutting back a shoot, choose a well-developed bud to cut back to. Remove crossing limbs, especially if they are rubbing on nearby shoots. In rose pruning, always bear in mind that new growth is what is required, and aim at renewing some portion of the framework of the plant each year by cutting away an old stem or branch, where a younger one is suitably situated to take its place. Prune weak-growing varieties of roses very lightly.

The best time to prune is late June or early July, with the exception of the Wichuraiana roses, e.g., *Paul's Scarlet Climber, American Pillar, Dorothy Perkins,* &c., which should be pruned after blooming in spring. *Lorraine Lee* is another exception to winter-pruning. This is a winter-flowering variety and to encourage blooms, at this time of the year, a light thinning-out should be given in February.

Pruning Shrubs and Trees

Shrubs and trees which produce their flowers on wood of the current season's growth, e.g., Hydrangea, Scarlet Hibiscus (General Corteges, for instance), Buddleia, and Fuchsia can be pruned in winter, or just as the plants commence growth in early spring. The growth produced last season is shortened back to well-placed buds, some thinning-out is done, and a few old shoots may be removed at the base.

Plants like Cytisus (Broom), Deutzia, Lilac, Philadelphus (the Mock Orange), Ribes (the flowering currant), Prunus (the flowering plums, peaches, and apricots), and Cydonia japonica (flowering quince) should be pruned while in bloom, or as soon as flowering is finished. The pruning of these shrubs and trees consists in removing completely, or shortening back to a few basal buds, the shoots which have just flowered, in order that new growth will be produced during spring and summer. This will flower next spring. Flowering plum trees are not usually pruned so heavily as the flowering peach trees, because they form blossoming spurs. Thinning out is usually sufficient. Flowering quince bushes (or as they are often called, "Japonica") are usually just thinned out a little at flowering time. New shoots on these plants do not bloom until the second year.

THE VEGETABLE GARDEN

June is one of the quietest months in the vegetable garden. When the soil is not too wet, beds which are not growing a green manure crop, may be dug over and prepared for sowings and plantings next month. Dig in plenty of organic matter, except in beds where early carrots and other root-crops are to be sown in the near future. If you intend to delay sowing carrots until late spring or early summer, the organic matter can be added, and a crop of lettuce or peas can be grown before sowing the carrot seed. After digging, leave the beds as rough as possible and apply lime to the surface, at the rate of 4 to 6 oz. per square yard. Do not lime heavily beds in which you intend to plant early potatoes in mid-August. If the soil is very acid, a light application of lime will not cause an increase in "scab" on potatoes.

Onions

Seed of *Victorian Brown,* and *Brown Spanish,* and *White Imperial Spanish* may be sown this month, or young seedlings can be planted out at the end of the month or in July. Onions enjoy a rich soil and if blood and bone manure or market garden fertilizer is lightly forked into the surface soil at the rate of from 2 to 3 oz. per square yard, depending on the fertility of the soil, the crop will grow quickly in the spring and "bulb" well in early summer. Do not disturb the surface roots of onions by deep cultivation or by pulling out large weeds. Remove the latter while they are still small. If the onions appear to take a long time to form bulbs, do not be discouraged. The onion will not commence to make the bulb until the days are increasing appreciably in length. Later when the bulbs are nearly fully developed, the tops may be bent over to hasten the completion of their development.

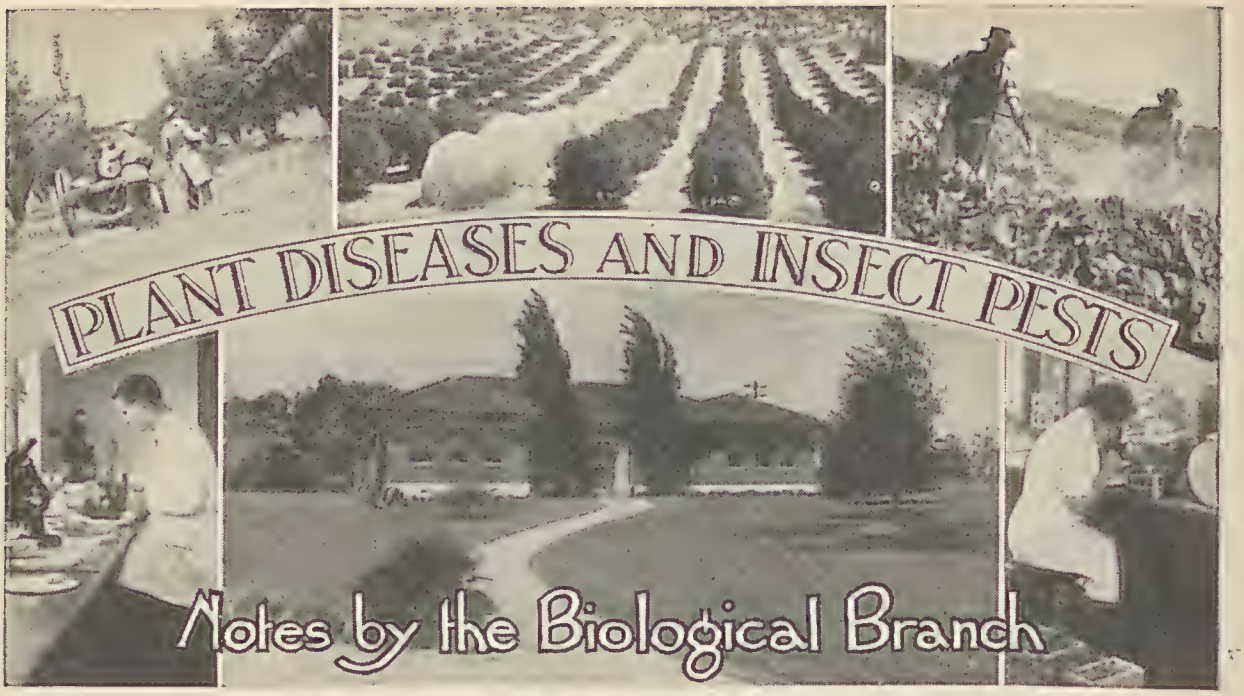
Cauliflower

As the head of the cauliflower appears among the young leaves, make sure that it is well protected from the light, and from applications of spray materials or dusts used for the control of the cabbage white butterfly, the cabbage moth, and aphis. Some varieties are called self-protecting, because the centre leaves are so large and numerous that they crowd over the developing "flower" and so protect it from light and spray material. If the "flower" is not protected, it often turns a greyish colour when cooked. Protection of varieties which usually expose the "flower" can be obtained by breaking the mid-rib of, say, two of the surrounding central leaves and bending them over the "flower." Alternatively, the centre leaves may be tied in a bunch over the head or "flower."

When cultivating cabbages, cauliflowers, and Brussel sprouts, draw the soil up to the plant. This assists in supporting the head.

Brussel Sprouts

Harvesting of Brussel sprouts commenced in May, and will continue until August or September. The "buttons" when fully developed can be removed quite easily from the axils of the leaves. The leaves under the sprouts may be broken off after the sprouts have been removed, but do not remove the top of the plant. If the sprouts do not appear to be forming and the plant is well grown, say, 18 inches to 2 feet high, then the centre growing tip may be pinched out; but do not remove the top leaves, because these are needed to feed the buttons near the top of the main stem. Once the growing point is removed, the crop of sprouts will be limited to the number of buds in the axils of the leaves, so do not remove the tip unless it is necessary. Brussel sprouts produce more and better "buttons" in a firm soil, therefore do not cultivate deeply. This should be done just deeply enough to remove the weeds while they are still small. Tramping over the beds does not adversely affect the "buttons," in fact, better "buttons" may be the result.



WHITE ROT OF ONIONS

White Rot is a root and bulb disease of onions caused by the fungal parasite *Sclerotium cepivorum,* which also attacks leeks, shallots, and garlic.

For many years this disease has caused serious losses in metropolitan market gardens, and it now appears to be spreading to country districts. During the past four years, onion specimens infected with White Rot have been submitted by growers in the following localities:—Portarlington, Colac, Warrnambool, Allendale, Killarney, Ballarat, Traralgon, Darnum, Bendigo, and Horsham.

The organism is capable of attacking plants at any stage of growth, and also may continue as a storage rot. In market gardens, where onions are raised in seed-beds, the disease usually occurs in patches, and may spread very rapidly, resulting in the death of a large number of seedlings.

Diseased plants may be detected by a yellowing of the leaves, which commence to die back from the tips. The infected plants either wither away slowly or wilt rapidly, according to the environmental conditions which may inhibit or encourage the growth of the fungus.

The bulbs of infected plants are usually covered with a white fungal weft which is studded with small black bodies about the size of poppy seeds.

When the parasite becomes established in the soil it may remain there almost indefinitely, even in the absence of onion crops, and in spite of the fact that it is capable of attacking plants of the onion family only.

The organism is usually introduced to clean areas by means of diseased seedlings or

Onions infected with White Rot.

Dead areas on rhubarb leaf caused by Downy Mildew.

sets. Disease development is most rapid at soil temperatures ranging from 60 to 70 deg. F., which normally occur during the late autumn and spring months. Disease development is completely inhibited at soil temperatures above 75 deg. F.

No satisfactory control measures have been worked out for this disease, but farmers whose livelihood depends on the growing of onions should observe the following precautions:—

1. Discontinue the growing of onions on infected land for an indefinite period wherever possible, or failing this to lengthen the rotation period between onion crops.

2. Destroy infected bulbs by burning. Do no feed infected refuse to stock.

As the majority of market-garden soils in the metropolitan area are heavily infected, market gardeners should not be influenced by the above-mentioned recommendations, which are concerned with the prevention of spread of this parasite in country onion-growing districts. In market gardens, the parasite could be readily controlled in seed beds by soil sterilization with a 2 per cent. solution of formalin in water applied by means of a sprinkler. This method is not possible at the present time as formalin supplies are not available. When formalin supplies are released interested growers should communicate with the Department for details of this method.

DOWNY MILDEW OF RHUBARB

Downy mildew of rhubarb is a disease caused by the fungal parasite, *Peronospora jaapiana*. The fungus attacks the lower surfaces of the leaves on which it produces a white or violet coloured furry growth. The infected tissue is eventually killed, and the leaves become chequered with large irregular dead areas, light tan in colour. If conditions are very favourable for disease development, the leaves may be completely destroyed.

The disease seldom causes the death of infected plants, but is responsible for a reduction in vigour and a consequent reduction in yield.

The parasite requires cool humid weather conditions for its optimum development. The most favourable conditions for the parasite occur during the late winter and spring months.

The lower leaves of infected plants should be stripped away until the crowns are exposed, and the plants should be sprayed thoroughly with 4:4:40 Bordeaux mixture, care being taken to drench the under surfaces of the leaves, which are usually in a vertical position at this stage.

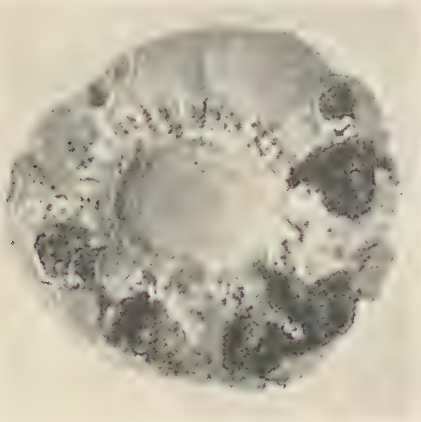
Spraying should be continued at fortnightly or three-weekly intervals throughout the spring and early summer months in order to keep a protective cover on the continuously emerging crown leaves.

BACTERIAL SCAB OF THE GLADIOLUS

There are several diseases which attack the gladiolus corm, and bacterial scab is one of the commonest of these. The disease may not be obvious until the bulb scales are removed, although it often causes spots on the scales. These spots finally become almost black in colour, and frequently split, giving the scales a ragged appearance. The most characteristic effect of the disease may be noticed when the scales are removed.

The brownish spots caused by the bacterium are regular in outline and are commonly almost circular. They are sunken, and have a distinct raised margin between the healthy and diseased tissue. Another distinctive feature is that the bacteria, which cause the disease, form a slime which dries out to a black glassy material, and this may frequently be observed in the centre of the spot.

The same organism occasionally attacks the base of the growing plant, causing a soft rot of the tissues, which leads to the death of the entire plant.



Gladiolus Scab.
[After *Moore.*

CONTROL.

All corms should be dipped before planting in a 1 in 1,000 solution of corrosive sublimate (mercuric chloride) for a period of 8 to 24 hours. A 1 in 1,000 solution may be prepared by pouring a little hot water over 1 ounce of mercuric chloride water in a non-metallic vessel. Then add cold water to bring the volume up to 6¼ gallons. The bulb scales must be removed before dipping.

Gladioli and Irises, which are also subject to the disease, should not be grown in infected soil for two or three years.

Soil drainage also is important, and it has been found that the incidence of the disease is much less in well drained soils.

WINTER CONTROL OF ORCHARD INSECT PESTS

During June, July, and August much can be done to control certain insect and mite pests attacking fruit trees. This is rendered possible because of the fact that certain insects and mites spend the winter either in the maturing, or the egg stage, and while the trees are dormant it is then possible to apply certain sprays and concentrations of sprays which would not be possible during the growing period.

Of the pests which can be controlled in this manner, the most important are the Black Cherry Aphis (*Myzus cerasi* F.), the Green Peach Aphis (*Myzus persicae* Sulz.), the Bryobia Mite (*Bryobia praetiosa* Koch.), the San Jose Scale (*Aspidiotus perniciosus* Comst.), and the Pear Leaf Blister Mite (*Eriophyes pyri* Pagen.).

Black Cherry Aphis

The Black Cherry Aphis, *Myzus cerasi* F., is an introduced insect which attacks both leaves and buds. The main damage to the trees is done in the early and late spring, particularly if the weather is cool. Under these conditions, large numbers of the black aphids, by sucking the sap from the under surfaces of the leaves, cause the leaf growth to be severely distorted and weakened, so that the developing cherries are partly unprotected from the weather, and are poor in quality. In very severe cases, defoliation of the trees may result, while buds seriously attacked may be killed.

The adult winged Cherry Aphis is black in colour, and measures roughly ⅛ inch in length. It first appears on the tree late in the spring or in the early summer, and is capable of flying from one part of a tree to another or to another nearby tree to set up new colonies.

Overwintering occurs in the form of a black, shiny egg, which is laid either on or adjacent to the buds. In the spring, with the first signs of bud movement, these eggs hatch to young brownish-black aphids, which commence to feed immediately on the buds or the young unfolding leaves, soon producing the typical distorted appearance of the leaves.

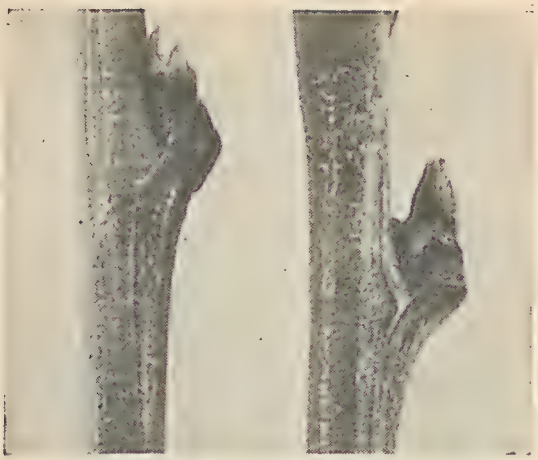
CONTROL.

The most satisfactory measure for the control of this pest is a tar distillate spray used at a strength of 1 in 50, when the tree is perfectly dormant in the winter, and certainly not later than the end of the first week in July, otherwise severe burning may result. Be thorough in the spraying, and make certain that no buds are missed.

Green Peach Aphis

The Green Peach Aphis, *Myzus persicae* Sulz., is also an introduced insect, attacking both peaches and nectarines, and is one of the principal aphis pests of fruit trees in this State.

Damage by the aphids may occur to both the blossoms and the buds, and to the leaves and shoots. With the buds and blossoms, the young aphids, immediately after hatching from the winter eggs, commence to feed, seriously damaging or even completely destroying the plant tissue, with the result that,



Eggs of the Green Peach Aphid behind peach buds.

in severe cases, the complete crop may be destroyed. With the leaves and shoots, the aphids use these as the chief source of food supply once blossoming is completed, and as a result the leaves become characteristically distorted.

Under plague conditions, as a result of the feeding of the aphids, normal development of the leaves is considerably hampered and leaf processes interfered with, while, resulting from leaf injury, the young twigs which were to bear the following season's fruit become stunted and distorted, and a proportion of them die. At this stage, trees may be completely defoliated.

This insect also overwinters in the form of black, shiny eggs which are laid in the autumn either on or adjacent to the buds.

CONTROL.

Peach trees should be sprayed during the winter months, and certainly not later than the middle of July, with a tar distillate spray at a strength of 1 in 35, or with one of the specially prepared oil emulsions containing certain toxic organic compounds.

Bryobia Mite

The Bryobia mite, *Bryobia praetiosa* Koch., is commonly found on the foliage of apples and pears during the summer months, being responsible for the production of yellowish, mottled leaves, with a general weakening of the vigour of the tree. The mites will be found on the under surfaces of the leaves.

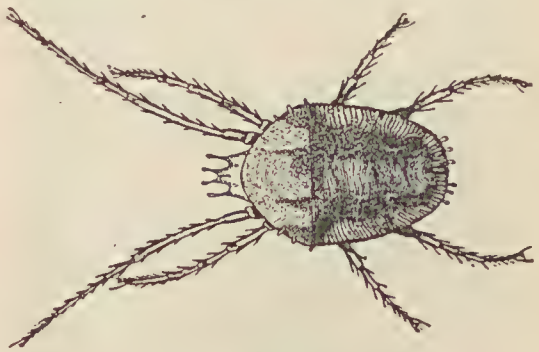
They are very small, measuring roughly 1/25th of an inch in length, are whitish to flesh coloured, and when present in large numbers on the leaf can be seen with the naked eye. They suck out the sap from the foliage, producing the mottling so typical of the species. In the late summer and early autumn, they lay their eggs, which are minute and pale pinkish in colour, on the twigs, stems, and trunk of the tree. Where the initial summer infestation has been high, the tree may be so plastered with these eggs that certain branches look as though they have been whitewashed.

CONTROL.

Control of this pest can be most satisfactorily carried out in the winter, provided the spray application is carefully and thoroughly applied so that the whole of the tree is wetted. Spraying with red spraying oil at a strength of 1 in 20, or with any of the recognized winter sprays recommended for the purpose, will give control. There is a certain amount of evidence to show that the longer this spray can be delayed without risking any injury to the tree, the better will be the control.

San Jose Scale

The San Jose Scale, *Aspidiotus perniciosus* Comst., is an introduced insect which is present to a greater or lesser extent in many parts of the State, particularly the north-east and Goulburn Valley areas. It chiefly attacks apples, pears, peaches, and cherries among the cultivated fruits.



Bryobia Mite.

It may occur on the trunk, limbs, twigs, and occasionally on the fruit of apple and pear trees. Trees lightly infested may show typical greyish scales on the surface of the bark, which frequently is reddened for a short distance around each of the scales themselves, this being particularly the case on young trees or on new growth of old trees. Trees heavily infested may show the whole of the surface of the bark heavily covered with a greyish scurf, which represents large numbers of the scales present, in many cases overlapping one another.

Infested trees may show a general decrease in vigour, while their foliage may or may not be yellowish. Sometimes there is an abundance of suckers or water shoots. The fruit also may be attacked, each scale on the surface of the fruit usually being surrounded by a reddish blotch or ring, which mars the appearance of the fruit, and renders it unfit for export.

Control.

On heavily infested trees, satisfactory control can be obtained by winter spraying with the following mixture:—

"Winter white oil"	..	2 gallons
Lime sulphur	..	5½ gallons
Water ..	..	72½ gallons

It is essential that the whole of the tree be thoroughly wetted, and preferable that the spraying be carried out on a bright sunny day.

On trees less heavily infested, a winter spraying with either lime sulphur, 1 in 9, or red or crude oil, 1 in 20, will prove satisfactory.

Pear tree recovering from San Jose scale following remedial measures. Note leaders killed by scale and new growth from crotch of tree.

An infested pear leaf showing first signs of injury caused by mites.

Pear Leaf Blister Mite

The Pear Leaf Blister Mite, *Eriophyes pyri* Pagen., is a pest restricted to pears in this State, although in other countries apples are occasionally attacked.

The first signs of injury are generally observed on the young leaves, which show small, pale greenish blisters scattered over the surface. It is in these blisters that the young mites live. Later, these blisters turn a dark-brown or yellow, and many of the infested leaves will fall. In the autumn, the adult mites leave the blisters and migrate to the buds where they hibernate over the winter.

The adult mite cannot be seen with the naked eye, as it measures only 1/120th of an inch, and there are frequently hundreds of these mites under each bud scale.

Control.

Control of this pest can be accomplished only by winter spraying, and, therefore, it is essential to make a good job of it at that time. Trees should be thoroughly sprayed with lime sulphur, 1 in 10, during the winter months and before any sign of bud movement takes place.

KETCHUP AND SAUCES

By the
Fruit Preserving Expert

OF these, there are thin liquid sauces, as mushroom ketchup, walnut ketchup, Worcester sauce, and such preparations; while the thicker varieties consist of tomato sauce and other thick substances, which may be made from fruits and various foundations flavoured accordingly. The tomato is a general favorite, and, while the ingredients may be varied to give a "mild" or "hot" result, the following is a medium :—

Tomato Sauce (1)

Take a quantity of tomatoes, say, about 20 lb., and pulp them by boiling rapidly until quite soft (no water should be added, but the tomatoes should be slightly crushed to commence the boiling). Pass the pulp through a sieve which will retain only the seeds and skins, then measure the strained pulp, and to each gallon of this allow—

4 oz. salt, 1½ lb. sugar, 1½ oz. garlic, 1 oz. allspice, 1 oz. cloves, 1 tablespoon mustard, ½ teaspoon cayenne, 1 qrt. good vinegar.

The whole spices may be suspended in a loose muslin bag while being boiled, and removed at finishing point.

The sauce is then boiled until of a right consistency, which may be tested by placing a little of the hot sauce on a plate, and if no watery liquid separates from the solid sauce, it is ready for bottling off into hot sterilized sauce bottles, and, when bottled, should be cooled off at once.

Tomato Sauce (2)

40 lb. tomatoes, 2½ lb. cored and peeled apples, 3 lb. sugar, 6 oz. salt, 1½ teaspoons cayenne pepper, 2 qrts. vinegar, 2 oz. cloves, 2 oz. black pepper, 2 oz. allspice, 2 oz. garlic.

Boil tomatoes and apples 1½ to 2 hours. Strain well. Stand overnight in an enamel or china bowl. The next day boil all ingredients for five or six hours, tying spices in a muslin bag.

Mushroom Ketchup

Put a quantity of suitable mushrooms into a deep jar and sprinkle them liberally with salt; allow them to remain twelve hours or so, then strain the juice through a piece of folded muslin (first having made the muslin wet and wrung the water from it). To each quart of mushroom liquid add half a teaspoonful of ground ginger and half a teaspoonful black pepper. Boil the ketchup in an iron-enamel saucepan until it is reduced to one-third, or slightly more. It is then ready to be poured into hot sterilized bottles. Make airtight while at the high temperature.

Small bottles are more convenient than large ones, for ketchup should be used within a few days when once a bottle has been opened.

Walnut Ketchup

This popular relish is made by pickling young green walnuts in vinegar and salt for eight or ten days. The liquid is then expressed and boiled up with spices, such as ginger, cloves, nutmegs, mace, and such flavourings as shallots, garlic, and horseradish, and is allowed to soak a short time before using.

Both mushroom and walnut ketchup enter largely into the preparation of other sauces or relishes which consist of a basis of vinegar, cayenne pepper, allspice, garlic, and other condiments. One of the kind is composed as follows :—

Worcester Sauce

2 qrts. malt vinegar, 4 tablespoons essence anchovy, 6 tablespoons walnut ketchup, 4 tablespoons soy, ½ level teaspoon of cayenne pepper, 2 cloves of garlic finely chopped.

Put all into a bottle, cork, and shake the mixture often for about two weeks, then simmer for ten minutes and strain into smaller bottles, and cork tightly.

Another is made up as follows :—

1 qrt. vinegar, ½ pint treacle, ¼ oz. pepper, ¼ oz. mace, ¼ oz. cayenne, ¼ oz. garlic, ¼ oz. cloves, ¾ lb. onions.

Steep for 14 days, then bring to boiling heat, and simmer for 20 minutes, strain, bring to boiling heat again, and very slightly thicken with a little browned flour (or corn flour) mixed with a little of the cold vinegar.

Bring the vinegar to boiling point, and allow to cool, and add other ingredients; put all into a large bottle and shake daily for eight or ten days, then strain and bottle.

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
J. L. Fry, Clematis Stud Poultry Farm, 858 Heidelberg-road, Alphington	10.2.43	60
M. A. Jones, Ringwood	22.2.43	352
Reformatory Prison, Castlemaine	3.3.43	299
F. W. Becker, Follett-road, Cheltenham	4.3.43	293
Mrs. C. Penn, Mayfield Poultry Farm, 53 Cromer-road, Beaumaris	15.3.43	527
Ridge and Son, Blackburn	17.3.43	682
Mrs. W. Davidson, Sherbrooke-avenue, Ringwood	24.3.43	103
Anthony Hamilton, "Lyncroft," Flinders	24.3.43	995
John J. King, New Gisborne	24.3.43	48
C. P. Salathiel, Hewitt's Poultry Farm, Skene-street, Bendigo	24.3.43	514
Stanley Wohlers, Box 12, Jung	24.3.43	199
Miss M. T. Gartner, "The Pines," 259 Middleborough-road, Box Hill	2.4.43	119
E. J. Greenshields, Lancefield	2.4.43	221
Alfred E. Hill, 26 Brenbeal-street, Balwyn, E.8	2.4.43	76
H. Mulconry, Callender-road, Noble Park	2.4.43	70
A. Sanders, Boronia-road, Wantirna	2.4.43	367
Frank W. Bentley, Hastings-road, Frankston	6.4.43	592
Mrs. M. A. Godfrey, "The Wattles," Healesville	6.4.43	271
C. W. Henderson, Shepparton East	6.4.43	367
Mrs. M. F. Skinner, Prince's Highway, Noble Park	14.4.43	81
E. Bartlett, Pimpinio	14.4.43	273
A. Counsell, Koomba-road, Wantirna	16.4.43	248
H. Everard, Hawkesdale	16.4.43	382
J. L. Mead, 28 Golf Links-avenue, Oakleigh, S.E.12	16.4.43	81
W. E. Molson, 188 Blackburn-road North, Blackburn	16.4.43	599
K. A. McLaughlin, "Dandevue Poultry Farm," Central-avenue, Bayswater	16.4.43	730
E. G. Vogt, McSwain-street, Mentone, S.11	16.4.43	165
R. Shipp, P.B., Kerang	22.4.43	454
J. E. Coupar, Box 18, Nathalia	3.5.43	458
D. Costos, cr. Collins and Waverley Roads, Oakleigh, S.E.12	3.5.43	769
Miss K. M. McLeod, "Hayfield," Diggers Rest	3.5.43	196
John Rae, 277 Albert-street, Sebastopol	3.5.43	1,736
Alex. Donald, "Ivyleigh Poultry Farm," New Gisborne	3.5.43	405
Mrs. J. E. Lennie, Mt. Scobie, via Kyabram	3.5.43	88
R. P. Gwyther, Valley-road, Highton, Geelong	10.5.43	294
Messrs. R. R. Christie and Son, St. Elmo Poultry Farm, Tucker-road, Bentleigh, S.E.14	10.5.43	728
Wm. Kenneally, Hallam-road, Hampton Park, via Dandenong	10.5.43	170
Mrs. R. Evans, 50 Simpson-street, Kyneton	10.5.43	101
G. D. Simpson, May-road, Glen Waverley	10.5.43	695
E. Smith, "Stapely," Valley-road, Highton, Geelong	10.5.43	211
John A. Stewart, Maldon-road, Castlemaine	10.5.43	653
J. C. Wimhurst, Tongala	10.5.43	398
R. S. Youl, "Wycherley" Stud Poultry Farm, Wedderburn	10.5.43	817
Walter C. Mackintosh, Neerim South	12.5.43	613
R. E. Throup, Neerim South	12.5.43	199
V. Williams, "Wangaratta Hatchery," 91 Tone-road, Wangaratta	12.5.43	448
Messrs. Hines Bros., Traynor's Lagoon, via St. Arnaud	12.5.43	1,300
F. J. L. Abernethy, Box 108, Horsham	13.5.43	445
A. W. Poulton, Vickers-street, Sebastopol	13.5.43	255
Geo. Winter, "Denehurst," Murgheboluc	13.5.43	293
J. Aitken, Silver-street, Cheltenham, S.22	13.5.43	900
P. Nemet, Spring Vale-road, Spring Vale	13.5.43	797
Messrs. F. S. Cox and C. P. West, Grange-road, Cheltenham	13.5.43	223
Messrs. Stiles Bros., "Fair View Poultry Farm," Wallan	13.5.43	795
Wm. Davis, New Gisborne	13.5.43	28

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66
Ballarat Orphanage ..	Ballarat	111
Banyule Stud Pty. Ltd.	Wangaratta ..	42
Black, I. S., Estate ..	Mount Noorat ..	53
Clarke, A. B. ..	Glenormiston South	15
Dennis, Mrs. A. A. ..	Frankston ..	33
Dookie Agricultural College	Dookie	77
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18
Geelong Grammar School	Corio	68
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	35
Gorman, A. W. ..	"Cathcart," Alexandra	61
Hollaway, R. W. ..	Caldermeade ..	75
Kilmany Park Farm Home for Boys	Sale	104
Lawrence, P. H. ..	"Rainga," Tarrawarra	72
Longerenong Agricultural College	Dooen	43
McNabb and Son, G. A.	Irrewillipe East ..	154
Northcote Children's Farm	Bacchus Marsh ..	156
Onley, W. H. ..	"Glenholme," Caldermeade	55
Payne, A. E. T. ..	"Yarra View," Lilydale	63
Payne, T. E. N. ..	"Woodburn," Kilmore	46
Poole, M. A. and D.	Caldermeade ..	134
Poole, M. A. and D.	Yannathan ..	72
Powell, T. S. ..	"Carellen," Mansfield	46
Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Samuel, Misses G. and E.	Lang Lang ..	48
School of Horticulture	Burnley	10
State Experiment Farm	Rutherglen ..	40
State Research Farm	Werribee	229
Tanner, N. J. ..	Pakenham ..	33
Vagg, T. E.	Officedale ..	45
Wells, W. G. ..	Caldermeade ..	65

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.
Anderson, J. B. ..	Warrnambool ..	19
Andison, J. A. ..	Thomastown ..	46
Andrew, J. C. ..	Whittlesea ..	121
Andrew, W. ..	Whittlesea ..	160
Andrews, E. H. ..	Templestowe ..	19
Barclay, A. H. ..	Whittlesea ..	107
Barling, J. ..	Mernda	33
Bates D. S. ..	Whittlesea North ..	25
Batten, R. J. ..	Wollert	44
Benson, R. ..	South Morang ..	35
Bodycoat, A. ..	Wollert	39
Booth, Mrs. A. ..	Warrandyte ..	8
Bourke, G. J. ..	Fairfield	82
Bourke, J. W. ..	Somerton	37
Bradbury, A. K. ..	Diamond Creek ..	50
Bradbury, G. ..	Kangaroo Flat ..	20
Browell, L. ..	Golden Square ..	15
Brownbill, C. ..	Bundoora	34
Bunting, J. ..	Epping	35
Butler, W. ..	Wallan	49
Callaghan, L. ..	Epping	34
Carr, W. J. ..	Wollert	65
Cavagna, Miss ..	Sedwick	7
Child, G. P. ..	Epping	53
Christian Bros. ..	Doreen	42
Clark, P. W. ..	Whittlesea ..	62
Collins, L.	Doreen	48
Cornfoot, D. H. ..	Whittlesea ..	43
Coulthard, J. J. ..	Whittlesea ..	76
Craker, Mrs. E. ..	Warrandyte ..	2
Cumming, H. R. ..	South Morang ..	23
Cunningham, E. C. ..	Templestowe ..	23
Danaher, J. V. ..	Whittlesea ..	70
Danns, N. C. ..	Whittlesea ..	34
Deutscher, H. W. ..	Mernda	168
Doggett, T. ..	Kangaroo Flat ..	17
Draper, L. S. ..	Wollert	31
Drysdale, J. C. ..	Warrandyte ..	41
Dunstan, W. ..	Pascoe Vale ..	32
Fellows Bros. ..	West Heidelberg ..	52
Fergusson, M. A. ..	Whittlesea ..	92
Fitzsimons, B. ..	Lower Templestowe	33
Fox, A.	Mernda	59
Galbraith and Walker	Greensborough ..	36
Gallagher, J. ..	Golden Square ..	20
Gamble Bros. ..	Greenvale ..	156

Name.	Address.	Number in Herd at Last Test.
Gallus, E. A.	Doncaster	14
Gardiner, C. E.	Epping	20
Gibbs, C.	Arthur's Creek	30
Gindice, J. J.	Kangaroo Flat	17
Goodman, A. E.	Broadmeadows East	55
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Gunn, W.	Kangaroo Flat	10
Hall, Mrs. J. E.	Whittlesea North	13
Hancorne, Miss M. R.	Yan Yean	34
Harding, J. E.	Templestowe	42
Harkness, H. J.	South Morang	31
Hawkes, Miss D.	Warrandyte	21
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howell, G. G.	Wollert	221
Hughes, J.	South Morang	1
Hussey, Mrs. S.	Warrandyte	1
Jackson, Mrs. M. A.	Heidelberg	11
Jackson, Mrs. M.	South Warrnambool	6
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jones, S. E.	Campbellfield	23
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	28
Kerr, J.	Mandurang	7
Kilpatrick, E.	Mernda	89
Lane, J.	Warrnambool	9
Latta, Mrs. J.	Warrnambool	6
Lawry Bros.	Tandara	113
Levett, E.	Warrnambool	12
Loft, A. H.	Wollert	52
Lynch, D.	Donnybrook	44
McCormack, D.	Woodstock	33
McCulloch, A. A.	Warrnambool	28
McDowell, R. H.	Greensborough	26
McGregor, W. B.	Mernda	41
McKay, J. M.	Coburg	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Maltzahn, Mrs. E. N.	Campbellfield	45
Mason, N.	Donnybrook	52
Maxwell J.	Whittlesea	32
May, Mrs. M.	Warrandyte	5
Mays, Mrs. A. M.	Doncaster	6
Merriman, J.	Diamond Creek	17
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	44
Mosig, H. C.	Epping	26
Nalder, H. S.	Epping	20
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
Nickols Bros.	Tandara	72
O'Hern, T.	Epping	58
O'Keefe, J. P.	Warrnambool	21
O'Loughlin, W. L.	Epping	27
Parker, Mrs. A. E.	Greensborough	24
Parker, R. H.	Craigieburn	91
Patullo, F. E.	Mickleham	36
Pilcher, W.	Kangaroo Flat	13
Pitson, R. H.	Yarrambat	19
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	48
Rawlings, J. H.	Whittlesea North	41
Rodgers, E.	Whittlesea North	14
Rosewarne, Miss P.	Yan Yean	40
Salathiel, R. W.	Big Hill	14
Seeber, B.	Thomastown	28
Semmens, J. H.	Sedgwick	18
Shanks, John	Mernda	73
Shaw-Logan T.	Glenroy	103
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, H.	Heidelberg	33
Smith, J. R.	Mernda	34
Smith, L. McA.	Yan Yean	2
Smith, L. W.	Bundoora	81
Smith, M.	Heidelberg	43
Smith, P. A.	Ivanhoe	2
Smith, R. A.	Epping	26
Smith, S. E.	Epping	33
Southon, H. W.	South Morang	60
Spruzen, G.	Wollert	41
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Story, T.	Mandurang	24
Thomas, Mrs. E.	Broadmeadows	11
Thomas, Mrs. V. E.	Yan Yean	31
Toman, Mrs. A.	Golden Square	11
Towt, C. W.	Glenvale	136
Trethowan, F. W.	Donnybrook	94
Trist, H. P.	Greensborough	8
Troutbeck, H. R.	Mickleham	47
Twomey, A.	Greenvale	39
Vallence, C. A.	Epping	19
Van, E. L.	Templestowe	28
Walsh, J. B.	Templestowe	11
Whelpton, B.	Whittlesea North	59
White, W.	Greensborough	17
Whittingham, E. W.	Greensborough	41
Williams, E. A.	Thomastown	32
Williamson, J.	Doncaster (High-st.)	4
Willis Bros.	Craigieburn	61
Wilson, J. E.	Diamond Creek	9
Wilson, Mrs. M.	South Morang	14
Wrest, W.	Epping	77
Wuchatsch, J. D.	Epping	14
Yann, R.	Wollert	52
Ziebell, H.	Thomastown	32

There are also 709 herds in which 14,696 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

Standard Herd Records

For Quarter ended 31st March, 1943

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 341, of which 260 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving)	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving)	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving)	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving)	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving)	330 lb. butter-fat.
Mature cow (5 years and over)	350 lb. butter-fat.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn (2).										
Willow Park Duchess 48th	1529c	273	25	10,227	3·32	339·2	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 15th	1533c	273	8½	8,757	3·32	290·3	330	Sr. 4	293, 326 ..	Anderson Imperial Cran 6th (Imp.)
Ballarat Orphanage, Ballarat, Jersey (6).										
Blackwood Grove Miss Leach	37935	273	14	6,255	4·53	283·2	350	Mature	405, 388, 369, 467, 414	Burnside Harmony
Murona Petal 2nd ..	45325	273	17	6,809	4·84	329·7	350	Mature	.. ..	Banyule Airpoise
Orphanage Bettine 2nd ..	68454	273	20	8,418	4·72	397·7	350	Mature	392, 337, 463	Orphanage Arvey
Orphanage Maud.. ..	41404	273	8	5,859	4·99	292·1	350	Mature	315, 420, 373, 448, 368, 398	Orphanage Quicksands Prince
Orphanage Melba 11th ..	63536	273	12	7,566	5·32	402·5	350	Mature	313, 450, 536, 429	Murona Twylair
Orphanage Molly 15th ..	C.R.	273	19	5,729	5·39	308·8	230	Jr. 2	.. ..	Clarendon Eyre Oxford Observer
Banyule Pty. Ltd., Wangaratta, Jersey (7).										
Banyule Ettie 21st ..	70185	240 (Sold)	..	6,000	5·64	338·5	290	Sr. 3	367 ..	Banyule Double Purple
Banyule Hawthorn 21st ..	56253	273	16	9,095	4·65	423·3	350	Mature	449, 439, 606	Banyule Oxford Don
Banyule Hawthorn 23rd ..	75073	273	15	6,215	4·92	305·6	230	Jr. 2	.. ..	Tavistock Honesty's Prince 2nd
Banyule Molly 62nd ..	60497	273	21	9,113	6·13	558·3	310	Jr. 4	447, 551 ..	Banyule Gipsy Moth
Banyule Silvermine 124th..	65347	273	20	8,523	5·22	444·7	290	Sr. 3	523 ..	Banyule Comet
Banyule Silvermine 134th..	70194	273	18	8,482	5·68	481·6	270	Jr. 3	471 ..	Banyule Upcast
Banyule Tiddlewinks 33rd	75076	273	9	4,656	6·08	283·0	230	Jr. 2	.. ..	Clarendon Eyre Lililite's Oxford 4th
Bennett, J. W., Yinnar, Jersey (1).										
Ellendale Kirsty 18th ..	57147	273	22½	9,263	5·15	477·0	350	Mature	499 ..	Staghorn Bellboy
Bennett, R. H., Lancefield, Jersey (3).										
Edenhope Northwood's Princess	71114	273	20	6,518	5·83	380·2	310	Jr. 4	340 ..	Lancefield Madeira's Choice
Edenhope Tulip	61372	273	17	7,730	5·39	417·0	350	Mature	333, 359, 430	Edenhope Canary's Count
Edenhope Iris	76034	273	18	6,627	5·95	394·0	290	Sr. 3	324, 328 ..	Jindivick Defiance
Black, Estate of the late I. S., Noorat, Ayrshire (3).										
Mount Noorat Alert 11th	33887	273	5½	4,503	4·58	206·3	290	Sr. 3	288 ..	Scottish Patron of Gowrie Park
Mount Noorat Boronia 3rd	29776	273	10	6,324	4·34	274·7	350	Mature	328, 410, 359	Scottish Patron of Gowrie Park
Mount Noorat Janice 6th	33890	273	11	5,195	4·11	213·7	270	Jr. 3	325 ..	Gowrie Park Bonnie Standard
Bott, J., Yarrawonga, Red Poll (5).										
Bundure Dual	5305AA	273	23½	8,930	3·98	355·6	350	Mature	.. ..	Bundure Wrangler
Bundure Mermaid ..	6325AA	273	26	7,619	4·42	336·9	330	Sr. 4	.. ..	Bundure Windsor
Naranghi Dina	Vol. 12	273	N.C.K.	6,473	3·59	232·6	250	Sr. 2	.. ..	Bundure Medal
Naranghi Drowsy ..	Vol. 12	273	N.C.K.	7,443	3·83	284·9	290	Sr. 3	.. ..	Bundure Winter
Naranghi Nutmeg ..	8005B	273	N.C.K.	8,562	4·16	355·8	330	Sr. 4	.. ..	Bundure Winter
Broad, Mrs. A. A., Sutton Grange, Jersey (2).										
Grangelea Rose 8th ..	71632	273	15	5,807	6·72	390·4	270	Jr. 3	304 ..	Banyule Macon
Grangelea Rosebud 7th ..	48572	273	18	8,129	5·22	424·7	350	Mature	279, 374, 347, 467, 315	Banyule Macon

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Broad, A. J., Pyramid, Jersey (1).										
Lynlea Rose Petal 3rd ..	Vol. 29	273	N.C.K.	4,776	5·80	276·8	230	Jr. 2	.. ..	Grangelea Max
Bruhn, C. H., Mirboo North, Jersey (2).										
Bindarring Tiddlewinks 10th	51801	273	15½	7,059	4·93	347·8	350	Mature	.. ..	Sefton Grange Flash Boy
Sylvan Hill Meadow Gleam	C.R.	273	9	4,684	6·04	282·8	250	Sr. 2	.. ..	Sylvan Hill Magnet
Carne, W. J., Pakenham Upper, Jersey (3).										
Barrowby Rose Fancy 2nd	Vol. 29	273	29	8,502	4·81	409·2	290	Sr. 3	.. ..	Mornmoot Meteor
Wompini Rosalie 2nd ..	38265	273	6	6,036	5·65	341·3	350	Mature	332, 412, 368	Brucevale Bright Star
Glencarne Primrose ..	Vol. 29	273	20	6,273	5·70	357·6	230	Jr. 2	.. ..	Primley Select
Chadderton, J. E., Hamilton, Jersey (6).										
Glen Leigh Damsel ..	52821	273	20	8,016	5·49	440·0	350	Mature	299, 354, 337, 382, 384	Glen Leigh Bounty
Glen Leigh Dancer ..	76345	273	11	4,340	5·69	247·1	230	Jr. 2	.. ..	Glen Leigh Volunteer
Glen Leigh Dawn 3rd ..	57357	273	16½	5,780	6·77	391·2	350	Mature	342, 344, 425	Selsey Jupiter
Glen Leigh Dear ..	76348	273	7	3,593	5·88	211·3	230	Jr. 2	.. ..	Selsey Taxpayer
Glen Leigh Diamond ..	66575	273	15	7,053	5·00	352·5	310	Jr. 4	279, 307 ..	Glen Leigh Volunteer
Glen Leigh Dolly 3rd ..	52824	273	6	8,163	5·15	420·5	350	Mature	354, 272, 463	Glen Leigh Bounty
Chirnside, R. M., Whittlesea, Jersey (1).										
Werribee Twilight 3rd ..	79589	273	24½	7,892	5·07	400·2	230	Jr. 2	.. ..	Staghorn Master's Clement
Clarke, F. W., Toora, Jersey (1).										
Mer Vue Wee Doris 4th ..	C.R.	273	N.C.K.	5,292	6·21	328·4	230	Jr. 2	.. ..	Mer Vue Jupiter
Clark, P. W., and Son, Whittlesea, Jersey (5).										
Coodardy Centurion's Bell	75737	273	19	7,364	5·52	406·8	310	Jr. 4	301 ..	Werribee Centurion
Coodardy Centurion's Fascination	70824	273	16	7,611	5·59	425·1	310	Jr. 4	285, 252 ..	Werribee Centurion
Coodardy Centurion's Liberty	70829	273	32	10,991	4·98	547·1	330	Sr. 4	413, 334 ..	Werribee Centurion
Mornmoot Northwood Madeira 13th	77853	273	23	7,590	4·94	375·0	230	Jr. 2	.. ..	War Valour (Imp.)
Werribee Fame	79583	273	20½	5,849	5·57	325·9	230	Jr. 2	.. ..	Werribee Rex
Colenso, L. W. R., Alvie, Jersey (9).										
Normandie Golden Nancy 3rd	68359	273	27	9,730	5·77	561·0	350	Mature	384, 405, 557	Normandie Majestic
Normandie Hawthorn 12th	63438	273	30½	9,689	5·46	528·8	350	Mature	180, 401, 347, 533	Normandie Mayflower's Fancy Masterpiece
Normandie Hawthorn 15th	68361	273	29	12,390	4·75	588·4	330	Sr. 4	303, 360, 557	Lewisham Playboy
Normandie Hawthorn 23rd	Vol. 29	273	17	5,648	5·32	300·5	230	Jr. 2	.. ..	Normandie Majestic
Normandie Ilma 6th ..	68362	273	27	9,343	5·84	545·2	350	Mature	358, 435, 472	Normandie Majestic
Normandie Ilma 10th ..	73203	273	20	8,180	4·62	378·0	290	Sr. 3	206, 324 ..	Lewisham Playboy
Normandie Ilma 13th ..	Vol. 29	273	21	6,831	5·86	400·4	250	Sr. 2	.. ..	Normandie Majestic
Normandie Lady May ..	Vol. 29	273	16	6,668	4·97	331·1	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Primrose 8th ..	Vol. 29	273	19	6,985	5·27	367·9	230	Jr. 2	.. ..	Normandie Majestic
Cook, D. E., Loch, Jersey (2).										
Wattle Vale Fay	Vol. 29	273	N.C.K.	5,292	5·19	274·5	330	Sr. 4	299 ..	Ewelme Eileen's Northerner
Wattle Vale Marigold ..	Vol. 29	273	N.C.K.	4,023	4·74	190·7	230	Jr. 2	.. ..	Ewelme Eileen's Northerner
Coulthard, J. J., Whittlesea, Jersey (2).										
Elmwood Merry Lark ..	57189	273	N.C.K.	6,635	4·87	323·0	350	Mature	363, 416, 335, 405, 386, 350	Austral Valley Lord Larkspur
Walamba Linda	Vol. 29	273	N.C.K.	4,638	5·96	276·5	230	Jr. 2	.. ..	Clarendon Eyre Brigadier 3rd
Cowan, G. L. S., Bacchus Marsh, Fresian (4).										
Ingolston Kittora ..	5677	273	N.O.C.	10,901	3·51	382·7	350	Mature	417 ..	Ingolston Sylvester
Ingolston Melba	5684	273	30	10,202	3·66	373·0	350	Mature	410 ..	Cordyline Cremona Pontiac
Ingolston Olga	5689	273	N.O.C.	12,826	3·41	437·7	350	Mature	405 ..	Ingolston Sylvester
Ingolston Ramona ..	5694	273	39	12,632	3·48	439·2	350	Mature	394 ..	Ingolston Sylvester
Cuddihy, T. D., Geelong, Jersey (5).										
Mount Anakie Connie ..	C.R.	273	N.C.K.	4,791	4·62	221·6	290	Sr. 3	237 ..	Mount Violet Count's Rochette
Mount Violet Countess Pearl	72973	273	N.C.K.	6,606	5·19	343·0	350	Mature	269 ..	Woodside Silver Count
Mount Violet Colleen's Kyeema	54278	273	N.C.K.	7,760	4·98	386·1	350	Mature	346 ..	Ballara Admiral
Mount Violet Fairy Madeira	72974	240	N.C.K.	7,455	4·48	333·7	350	Mature	352 ..	Mount Violet Madeira's Count
Pivot Eleanor	Vol. 29	273	N.C.K.	4,244	4·88	207·2	230	Jr. 2	.. ..	Mount Violet Kyeema You'll Do

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
De La Rue, N. C., Weering, Jersey (2).										
Lucerne Vale Queen's Attraction	Vol. 30	273	8	4,151	5·30	219·8	230	Jr. 2	.. ..	Mornmoot Monitor
Victoria Winsome ..	37218	273	25	8,672	5·20	451·0	350	Mature	377, 479, 435, 352, 511, 444, 490	Victoria Master Mariner
Dennis, Mrs. A. A., Frankston, Jersey (3).										
Ballam June	75003	273	16	5,748	5·87	337·4	230	Jr. 2	.. ..	The Wattles Gamboge Prince
Ballam Princess	65288	273	26	9,960	5·24	521·8	290	Sr. 3	358, 365 ..	The Wattles Gamboge Prince
Ballam Verna	75004	273	17½	6,479	5·94	384·6	230	Jr. 2	.. ..	The Wattles Gamboge Prince
Department of Agriculture, Werribee, Friesian (3).										
Victoria Cora	Vol. 15	273	N.C.K.	9,863	3·29	324·0	270	Jr. 3	337 ..	Anama Netherlands Neptune
Victoria Primula ..	Vol. 15	273	N.C.K.	7,454	4·38	326·5	230	Jr. 2	.. ..	Victoria Conductor
Victoria Wooderest Josie..	6103	273	N.C.K.	10,979	3·75	412·2	350	Mature	313, 403 ..	Rupertswood Inka Jo
Department of Agriculture, Werribee, Red Poll (20).										
Victoria Albino	C.R.	273	N.C.K.	4,878	4·66	227·4	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Amethyst ..	7952A	210 (Sold)	N.C.K.	5,220	4·98	259·9	330	Sr. 4	284, 300 ..	Victoria Donald
Victoria Anvil	Vol. 12	273	N.C.K.	7,463	4·63	345·9	250	Sr. 2	.. ..	Victoria Petrology
Victoria Bodikin ..	7010A	273	N.C.K.	9,027	4·26	384·3	350	Mature	277, 357, 465	Victoria Goblin
Victoria Checky	Vol. 12	273	N.C.K.	7,761	4·64	360·3	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Electricity ..	Vol. 12	273	N.C.K.	8,304	4·39	364·5	230	Jr. 2	.. ..	Victoria Robin Hood
Victoria Gem	Vol. 12	273	N.C.K.	5,126	4·39	225·0	250	Sr. 2	.. ..	Victoria Petrology
Victoria Gloriosa ..	7583AA	273	N.C.K.	8,321	4·08	339·1	330	Sr. 4	353 ..	Victoria Donald
Victoria Kinetica ..	4889A	273	N.C.K.	7,845	3·60	282·1	350	Mature	277, 405, 440, 505, 525	Victoria Gallant
Victoria Mary Rose ..	6711AA	273	N.C.K.	6,536	3·56	232·7	350	Mature	319, 436, 457	Chandpara Valentine
Victoria Mistress B ..	Vol. 12	273	N.C.K.	9,110	4·19	382·0	250	Sr. 2	.. ..	Burnwood Masterpiece
Victoria Needle	Vol. 12	273	N.C.K.	8,064	4·55	367·3	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Passion ..	Vol. 12	273	N.C.K.	6,588	3·66	241·4	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Pepita	6027A	273	N.C.K.	8,798	4·37	384·9	350	Mature	370, 406, 419, 429	Woodburn Peter Pan
Victoria Persephone ..	Vol. 12	273	N.C.K.	7,616	4·39	334·4	290	Sr. 3	412 ..	Woodburn Peter Pan
Victoria Pomona ..	C.R.	273	N.C.K.	7,472	4·31	321·9	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Queenie ..	Vol. 12	273	N.C.K.	7,710	4·37	337·1	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Rosebloom ..	7587AA	273	N.C.K.	5,913	4·37	258·3	270	Jr. 3	330 ..	Woodburn Peter Pan
Victoria Rosie	7588AA	273	N.C.K.	4,919	4·63	227·6	310	Jr. 4	191 ..	Chandpara Valentine
Victoria Whirlwind ..	7030A	273	N.C.K.	7,530	4·11	309·6	350	Mature	330, 408, 513	Victoria Goblin
Desmond, J. J., Rochester, Jersey (4).										
Macroom Adair's Ellen ..	C.R.	273	N.C.K.	9,201	5·27	485·0	310	Jr. 4	.. ..	Clifford Farm Robin Adair
Macroom Ellen Bell ..	77510	273	N.C.K.	5,622	5·16	290·1	290	Sr. 3	.. ..	Clifford Farm Robin Adair
Macroom Farm Lass 5th ..	C.R.	273	N.C.K.	6,527	5·30	345·8	290	Sr. 3	.. ..	Clifford Farm Robin Adair
Macroom Nellie 3rd ..	C.R.	180	N.C.K.	2,782	5·68	157·9	230	Jr. 2	.. ..	Clifford Farm V.C's. Skipper
Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (5).										
Belgonia Design's Lady 2nd	56315	273	10½	7,067	5·39	380·6	350	Mature	312, 261, 373, 396	Design's Ruler (Imp.)
Glen Iris Golden Maid ..	39839	273	16½	6,155	5·73	352·7	350	Mature	364, 375, 372	Rochette's Golden (Imp.)
Glen Iris Royal Chance ..	71420	273	22	8,564	5·85	500·8	330	Sr. 4	323, 349 ..	Glen Iris Royal Gallant
Karrara Fancy Madeira ..	67354	273	31	10,465	5·85	612·6	350	Mature	446, 652, 583	Victorious Pioneer (Imp.)
Karrara Inspiration ..	77080	273	15	6,385	6·72	429·3	270	Jr. 3	288 ..	Brampton Great Boy (Imp.)
Dookie Agricultural College, Dookie, Ayrshire (3).										
Dookie Adorn	32241	273	14½	9,749	3·97	387·2	350	Mature	324, 360 ..	Tregorland Indispensible
Dookie Laburnum ..	33480	273	17	7,896	3·99	314·8	290	Sr. 3	245 ..	Gowrie Park Bonnie Sailor
Dookie Siren	33481	273	14	6,694	3·75	250·9	290	Sr. 3	181 ..	Gowrie Park Bonnie Sailor
Dunmore, T. J., Melton, Jersey (1).										
Elderslie Lady Aster 3rd..	76054	273	20	6,471	4·81	311·3	270	Jr. 3	263 ..	Banyule Stope
Fairchild and Clutterbuck, Tinamba, Jersey (10).										
Banyule Lady Merton ..	60495	273	N.C.K.	10,164	5·73	582·3	350	Mature	443 ..	Banyule Oxford Don
Carellen Lady Charm ..	65875	273	N.C.K.	6,738	6·25	421·0	330	Sr. 4	413, 440 ..	Darnum Park Lord Starbright
Fairbank Butterfly 2nd ..	57253	273	N.C.K.	7,569	5·92	447·9	350	Mature	270, 330, 400	Wompini Beau Brummel
Selsey Lotus 3rd ..	73380	273	N.C.K.	7,970	4·99	397·7	330	Sr. 4	341, 397 ..	Brampton Son of Champions (Imp.)
Vaucluse Blossom 5th ..	Vol. 29	273	N.C.K.	5,376	4·81	258·4	230	Jr. 2	.. ..	Vaucluse Masterpiece
Vaucluse Daphne 5th ..	Vol. 29	273	N.C.K.	7,283	5·56	405·1	250	Sr. 2	.. ..	Vaucluse Masterpiece
Vaucluse Free Girl ..	Vol. 29	273	N.C.K.	6,681	4·75	317·5	230	Jr. 2	.. ..	Vaucluse Masterpiece
Vaucluse Pansy 3rd ..	Vol. 29	273	N.C.K.	6,061	5·41	328·2	230	Jr. 2	.. ..	Vaucluse Masterpiece
Vaucluse Tinsel 3rd ..	74354	273	N.C.K.	6,612	5·88	388·8	310	Jr. 4	331, 420 ..	Paisley Master
Vaucluse Duchess 4th ..	79404	273	N.C.K.	7,176	6·03	433·0	270	Jr. 3	280 ..	Paisley Master
Fixter, A., Boisdale, Guernsey (2).										
Avonview Doreen ..	6727	273	20	7,400	5·92	438·4	310	Jr. 4	301, 382 ..	Kentdale Monogram
Avonview Jean	6729	273	19	8,060	5·97	481·3	350	Mature	351, 417, 382	Kentdale Monogram

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Gay, R. G., and Son, Yarram, Jersey (3).										
Elm Grove Golden Bluebelle	Vol. 29	273	N.C.K.	6,801	5·49	373·4	250	Sr. 2	.. ..	Elm Grove Gold Star
Elm Grove Laurette 2nd ..	61465	273	N.C.K.	10,368	5·25	544·4	350	Mature	310, 501, 423	Elm Grove Graceful's Masterpiece
Elm Grove Silvershine ..	71183	273	N.C.K.	6,627	6·14	407·0	310	Jr. 4	290, 394 ..	Gold Star of Melrose
Goddard, J. H., Cora Lynn, Ayrshire (1).										
Myola Lady Tina ..	29792	273	20	10,077	4·32	435·5	350	Mature	... .	Benbecula Bonnie Willie
Handbury, J. E., and Son, Toora, Jersey (3).										
Tooravale Lassie 17th ..	55580	273	N.C.K.	7,787	5·31	413·7	350	Mature	318, 423, 458, 482, 529	Kings Vale Monica 14th Son
Tooravale Lassie 30th ..	74221	273	N.C.K.	5,832	6·43	374·8	350	Mature	402, 395, 393	Pinewoods Aristocrat
Tooravale Princess 35th ..	79277	273	N.C.K.	5,870	5·93	348·3	290	Sr. 3	287, 363 ..	Pinewoods Aristocrat
Harvey, T., Boisdale, Jersey (3).										
Jerseyholm Bluebell 36th	62307	273	N.C.K.	6,894	4·79	330·4	350	Mature	227, 323, 241	Banyule Biplane
Jerseyholm Bluebell 44th	67191	273	N.C.K.	5,704	4·90	279·6	310	Jr. 4	245, 213 ..	Orphanage Molly's Commander
Jerseyholm Empress 67th	71971	273	N.C.K.	6,537	5·94	388·1	270	Jr. 3	201 ..	Orphanage Molly's Commander
Haywood, Dr. A. R., Hastings, Jersey (4).										
Troed-yr-Rhiw Tawelwych 6th	74269	273	N.C.K.	9,597	4·94	474·4	330	Sr. 4	350, 509	Clarendon Eyre Eminent's Boomerang 6th
Windrest Chevy's Cherub	64936	273	N.C.K.	9,539	5·61	535·3	350	Mature	386, 355, 423, 602	Glen Iris Matador
Windrest Island Serene ..	79660	273	N.C.K.	8,810	5·59	492·6	290	Sr. 3	462 ..	Gadget (Imp.)
Windrest Island Star ..	69734	273	N.C.K.	9,115	4·80	437·6	350	Mature	321, 274 ..	Gadget (Imp.)
Hicks, E. J., Blains, Jersey (1).										
Echuca Essie	76024	273	N.C.K.	5,007	6·00	300·5	290	Sr. 3	326 .	Ullina Bellboy
Higgins, J. A. A., Keysborough, Guernsey (1).										
Kentdale Mavis	7229	273	9½	6,374	5·13	327·3	330	Sr. 4	241 ..	Kentdale Anthony
Hodgins, G. E., Hastings, Jersey (4).										
Verjean Velvet	74361	273	14	7,454	5·75	428·8	310	Jr. 4	344 .	Jorian Great Boy
Verjean Venus 2nd ..	74363	273	24	8,796	5·36	471·1	270	Jr. 3	306, 352 .	Jorian Great Boy
Verjean Verbena 2nd ..	74364	273	22	9,038	5·02	454·0	270	Jr. 3	323 ..	Jorian Great Boy
Verjean Vienna	74366	273	16	6,083	5·60	340·7	270	Jr. 3	309 ..	Ardleigh Prince Chut
Hore, E., Leitchville, Jersey (3).										
Milvue Aim's Dainty ..	Vol. 29	273	N.C.K.	6,293	5·49	345·3	230	Jr. 2	.. .	Belgonia Peggy 11th's Aim
Milvue Design's Amy ..	Vol. 29	273	N.C.K.	8,043	5·03	404·8	250	Sr. 2	.. ..	Belgonia Peggy 11th's Aim
Milvue Design's Bettwys ..	72839	273	N.C.K.	10,862	4·48	486·8	310	Jr. 4	353, 459 ..	Milvue Rosalind's Ruler
Hore, M. T., Horfield, Friesian (1).										
Elmar Lena	C.R.	273	N.C.K.	11,388	2·84	322·9	290	Sr. 3	264 .	Burnbank Iona Rock
Huffer, J. A., Gormandale, Jersey (2).										
Glenvalley Bell Bird ..	C.R.	273	N.C.K.	5,907	5·48	323·9	230	Jr. 2	. .	Glenvalley Handsome Twylish
Glenvalley Silver Wattle ..	Vol. 29	273	N.C.K.	6,232	5·74	357·6	250	Sr. 2	. .	Glenvalley Waverley's Espectation
Hurrey, Estate of the late W. H., Koonwarra, Jersey (6).										
Burwood Cream Belle 3rd	60926	273	16	7,103	5·09	361·3	350	Mature	280, 349, 356	Kooreena Handsome Lad
Burwood Cream Belle 5th	60928	273	14	7,862	4·95	389·1	350	Mature	299, 334, 372	Kooreena Handsome Lad
Kooreena Carrie 7th ..	58055	273	14	6,060	6·04	365·8	350	Mature	279, 239, 378, 420, 376	Kooreena Carrie 3rd's Halo
Kooreena Dainty Maid ..	Vol. 29	273	20	6,675	5·51	367·8	310	Jr. 4	255, 304 ..	Kooreena Good Luck
Kooreena Maranta 16th ..	62629	273	12	8,016	5·68	455·4	350	Mature	367, 398, 376, 407	Kooreena Carrie 3rd's Halo
Kooreena Yo Yo 3rd ..	62631	273	17	7,092	5·81	411·9	350	Mature	314, 368, 339, 384	Kooreena Mourier King 2nd
Langlands, F. B., Horsham, Jersey (3).										
Brierwood Carnation ..	Vol. 30	273	N.C.K.	5,710	5·16	294·4	230	Jr. 2	.. ..	Orphanage Charger
Brierwood Golden Maid ..	65637	273	N.C.K.	6,313	5·66	357·2	350	Mature	377 ..	Murona Twylair
Brierwood Volunteer's Rose	70484	273	N.C.K.	5,673	5·09	288·8	350	Mature	380 .	Orphanage Lady's Vanguard
Lind, A. E., and Sons, Mount Taylor, Jersey (2).										
Sunny Dell Air Queen ..	Vol. 30	210	4	2,910	6·20	180·3	230	Jr. 2	.. ..	Banyule Mollison
Wonga Park Standard Dream	Vol. 30	273	12	4,421	6·34	280·1	230	Jr. 2	.. ..	Brampton Noble Standard (Imp.)
Linke, H. P., Tarrington, Dairy Shorthorn (3).										
Corresdean Beauty ..	1787E	273	19	10,247	3·69	377·7	350	Mature	302 ..	Willow Park Revenue 2nd
Corresdean Fairy	1788E	273	23½	7,787	3·45	268·7	270	Jr. 3	251 ..	Drumnell Prince 3rd
Corresdean Roany ..	1796E	273	27	8,732	3·63	316·8	350	Mature	304 ..	Willow Park Revenue 2nd

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Longerenong Agricultural College, Dooen, Ayrshire (2).										
Longerenong Cootamundra Wattle 8th	32772	273	13	7,181	4·31	309·2	250	Sr. 2	..	Dookie Signet
Longerenong Cootamundra Wattle 9th	33863	273	6	4,595	4·34	199·6	230	Jr. 2	..	Dookie Signet
Lyon, W. H., Sale, Jersey (6).										
Avon Belladonna ..	C.R.	273	N.C.K.	5,573	6·09	339·3	230	Jr. 2	..	Avon Ruby's Count
Avon Deanna	C.R.	273	N.C.K.	6,120	6·00	367·1	250	Sr. 2	..	Avon Ruby's Count
Avon Lalla	74952	273	N.C.K.	9,032	5·81	525·1	350	Mature	441	Staghorn Larkspur's Majesty
Avon Linaria	C.R.	273	N.C.K.	5,757	5·70	328·0	310	Jr. 4	..	Ruby's Beau (Imp.)
Avon Nadine ..	Vol. 30	273	N.C.K.	6,983	5·98	417·4	310	Jr. 4	207	Ruby's Beau (Imp.)
Avon Princess Royal ..	C.R.	240	N.C.K.	4,372	6·52	285·1	310	Jr. 4	229	Ruby's Beau (Imp.)
Macauley, C. W. W., Rochester, Jersey (6).										
Taranah Flora 5th .	C.R.	273	N.C.K.	3,881	6·18	240·0	230	Jr. 2	..	Taranah Dignity
Taranah Flora 6th ..	Vol. 30	273	N.C.K.	6,489	5·72	371·0	230	Jr. 2	..	Werribee Twylish Master
Taranah Flora 7th ..	Vol. 29	273	N.C.K.	5,600	5·02	281·3	230	Jr. 2	..	Werribee Twylish Master
Taranah Floss 5th ..	Vol. 29	273	N.C.K.	4,841	4·92	238·4	250	Sr. 2	176	Taranah Champion
Taranah Radiance 2nd ..	59634	240	N.C.K.	4,815	5·29	254·8	350	Mature	348, 364, 527, 431, 408	Taranah Commander
Taranah Rainbow 7th .	Vol. 30	273	N.C.K.	4,424	5·78	255·9	230	Jr. 2	..	Taranah Dignity
McCormack, M., and Sons, Mansfield, Red Poll (13).										
Chandpara Poa	5371AA	273	15½	8,874	4·49	398·4	350	Mature	390	Victoria John of Gaunt
Cypress Blonde .. .	5116C	273	12½	8,018	4·38	351·4	350	Mature	393	Woodburn Glennie
Cypress Bonzer	7072B	273	8	7,005	3·64	254·7	290	Sr. 3	263	Northwood Prior
Cypress Cherry Plum ..	6387AA	273	10	8,259	3·74	308·6	290	Sr. 3	298	Northwood Prior
Chandpara Chevron .	2629AA	273	10	8,370	3·48	291·0	350	Mature	292	Chandpara Valentine
Cypress Countess.. ..	7232AA	273	6	7,038	3·94	277·0	250	Sr. 2	..	Burnwood Whistler
Cypress Enid	5118C	273	20	9,135	4·07	371·8	350	Mature	413	Woodburn Glennie
Cypress Ladysmith ..	5191D	273	9	7,947	3·93	312·6	350	Mature	258	Victoria Sovereign
Cypress Marsellaise ..	5121C	273	15½	10,577	3·41	360·8	350	Mature	340	Woodburn Glennie
Cypress Midget	7697A	240	4	6,435	4·33	278·5	290	Sr. 3	311	Northwood Prior
Cypress Pet	7073B	273	21½	8,900	3·64	323·8	330	Sr. 4	264	Victoria Sovereign
Cypress Pincher	7327AA	273	4½	6,704	4·71	315·6	250	Sr. 2	247	Burnwood Whistler
Cypress Polynesian ..	8002B	240	4	5,865	4·01	234·9	250	Sr. 2	..	Burnwood Whistler
McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (3).										
Kameruka Viking Sparkshine	67313	273	14½	6,564	5·23	343·3	310	Jr. 4	334	Werribee Viking
Spring Valley Merle 4th ..	73915	273	11	5,476	5·30	290·0	330	Sr. 4	385	Selsey Great Peer
Spring Valley Virginia 47th	78923	273	9	4,641	5·43	252·1	270	Jr. 3	288	Pine Grove Larkspur's King
McNabb, G. A., and Son, Irrewillipe East, Jersey (19).										
Avalon Madeira's Pansy 6th	65234	273	N.C.K.	8,027	4·88	391·7	330	Sr. 4	444, 481, 423	Mornmoot Prince Madeira
Greenwood Plunder ..	71671	273	N.C.K.	5,765	5·88	338·7	290	Sr. 3	388	Greenwood Jimmy
Maxon Bright Favourite 3rd	72713	273	N.C.K.	7,050	5·06	356·9	290	Sr. 3	275	Maxon Starbright Prince 5th
Maxon Count's Alsyke 4th	58348	273	N.C.K.	6,318	5·73	361·9	350	Mature	331, 259, 427, 357	Maxon Count Graceful
Maxon Count's Favourite 7th	77621	273	N.C.K.	6,275	5·24	323·7	250	Sr. 2	284	Maxon Count Graceful
Maxon D's Alsyke ..	Vol. 29	273	N.C.K.	5,102	5·19	264·9	230	Jr. 2	..	Maxon Count's Dawn
Maxon D's Cornice ..	Vol. 29	273	N.C.K.	4,319	6·24	269·3	230	Jr. 2	..	Maxon Count's Dawn
Maxon D's Favourite ..	Vol. 29	273	N.C.K.	5,705	5·76	328·7	230	Jr. 2	..	Maxon Count's Dawn
Maxon Graceful Duchess 4th	63001	273	N.C.K.	8,246	5·69	469·6	350	Mature	230, 489, 526	Maxon Chieftain
Maxon Graceful Duchess 5th	Vol. 29	273	N.C.K.	9,158	5·84	535·1	230	Jr. 2	..	Maxon Handsome Boy
Maxon Handsome Clara ..	Vol. 29	273	N.C.K.	4,419	6·65	293·8	230	Jr. 2	..	Maxon Handsome Boy
Maxon Handsome Goldfinch	Vol. 29	273	N.C.K.	5,691	6·52	371·1	230	Jr. 2	..	Maxon Handsome Boy
Maxon Handsome Light ..	77632	273	N.C.K.	6,459	5·54	358·1	250	Sr. 2	294	Maxon Handsome Boy
Maxon Linnacre's Alsyke ..	63002	273	N.C.K.	7,005	5·34	374·3	350	Mature	193, 405, 426	Maxon Linnacre's Starbright 2nd
Maxon Linnacre's Clara ..	63003	210 (Sold)	..	5,130	5·77	296·2	350	Mature	167, 351, 353	Maxon Linnacre's Starbright 2nd
Maxon Noble's Ranunculus 2nd	67854	273	N.C.K.	10,741	5·03	539·9	350	Mature	400, 444, 491	Maxon Duchess Noble
Maxon S.B's Alsyke ..	Vol. 29	273	N.C.K.	4,653	5·36	249·2	230	Jr. 2	..	Maxon Pansy's Starbright
Maxon S.B's Favourite ..	Vol. 29	273	N.C.K.	4,946	5·79	286·2	230	Jr. 2	..	Maxon Pansy's Starbright
Maxon Starbright's Pansy 2nd	77634	273	N.C.K.	6,814	4·95	337·3	250	Sr. 2	241	Avalon Starbright 8th
Maher, R. H., Tongala, Jersey (4).										
Rosemont Duchess Fowler	59283	273	N.C.K.	6,592	5·02	330·8	350	Mature	339, 294, 312	Rosemont Golden Emblem
Rosemont Jenny Lind 17th	78705	273	12	5,168	5·77	298·1	330	Sr. 4	262	Belgonia Perree
Rosemont Laura 7th ..	50461	273	N.C.K.	6,008	5·57	334·9	350	Mature	247, 311, 315, 284	Rosemont Laddie Fowler 3rd
Rosemont Silvermine 21st	Vol. 29	273	17	5,053	4·99	252·0	230	Jr. 2	..	Belgonia Aim High
Mason, V. J., Ferntree Gully, Guernsey (2).										
Osmaine Janet .. .	7712	273	N.C.K.	6,258	5·05	316·2	350	Mature	411	Yarraview Nightmarch
Road's End Jeanne ..	4803	273	N.C.K.	6,102	5·13	313·1	350	Mature	468, 512	Glenburnie Ideal (Imp.)
Mitchell, R. H., Linton, Jersey (1).										
Clifford Farm Viola	61103	273	25½	8,748	5·50	481·2	350	Mature	317, 401, 467	Wompini V.C.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Moore, J., and Co., Yarram, Jersey (7).										
Tooloonook Camille 2nd ..	79248	273	N.C.K.	7,116	4·84	344·2	270	Jr. 3	172 ..	Belgonia Lady's Duke
Tooloonook Molly 19th ..	79252	273	N.C.K.	8,880	5·25	466·0	290	Sr. 3	197 ..	Belgonia Lady's Duke
Tooloonook Onyx ..	69399	273	N.C.K.	7,064	5·03	355·5	350	Mature	302, 248, 272	Rydon Premier
Tooloonook Peach 8th ..	64599	273	N.C.K.	6,086	5·53	336·6	350	Mature	228, 290, 283	Tooloonook Carob's Hero
Tooloonook Peach 18th ..	C.R.	273	N.C.K.	7,115	4·66	331·3	230	Jr. 2 ..	..	Belgonia Junette 2nd's Design
Tooloonook Polygold 2nd	Vol. 29	273	N.C.K.	8,364	5·51	461·2	330	Sr. 4 ..	..	Latrobe Musician
Tooloonook Sainfoin 7th ..	74216	273	N.C.K.	7,261	5·44	395·2	310	Jr. 4	184, 203 ..	Belgonia Lady's Duke
Nash, L., Launching Place, Jersey (1).										
Elm Grove Veronique ..	57177	210	4	4,177	6·30	263·3	350	Mature	223, 323, 416, 441, 262	Elm Grove Starlight
Nicholas, M. A., Sherbrooke, Jersey (1).										
Selsey Royal Lily ..	73882	273	17	6,066	5·09	308·6	290	Sr. 3	358 ..	Selsey Right Royal
Nicholson, A. N., Moorooduc, Illawarra, Shorthorn (2).										
Devondale Buttercup 6th	24657	273	N.C.K.	7,697	3·90	300·1	350	Mature	.. ..	Broughton of Swanlea
Devondale Gentle 5th ..	Vol. 8	273	N.C.K.	7,429	4·52	336·1	350	Mature	.. ..	Broughton of Swanlea
Noonan, G., Benalla, Jersey (4).										
Ambyne Noble Queen ..	Vol. 29	273	12	6,431	5·45	350·5	270	Jr. 3	.. ..	Avalon Noble 16th
Carellen Charmain ..	Vol. 29	273	13	5,591	5·53	309·1	290	Sr. 3	.. ..	Werribee Madeira's Ace
Keyuga Beauty	53544	273	7	5,094	5·15	262·4	330	Sr. 4	317, 298 ..	Keyuga Bold Pilot
Ripple Vale Isabelle ..	78609	273	13½	5,981	6·01	359·6	290	Sr. 3	.. ..	Bellefaire Blonde's Bonjour
O'Neill, J., Echuca Village, Jersey (1).										
Ullina Bonnie	69475	273	22	8,171	6·15	502·8	350	Mature	334, 303, 458	Ballara Fancy King
Parker, L. M., Tallarook, Dairy Shorthorn (10).										
Deep Dale Beryl ..	C.C.	273	14	6,834	4·02	274·7	250	Sr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Daphne ..	1806E	273	10	9,029	3·86	348·1	350	Mature	439, 374 ..	Willow Park Banker 3rd
Deep Dale Daisy ..	1805E	273	20	11,780	4·02	473·1	350	Mature	387 ..	Willow Park Banker 3rd
Deep Dale Fairy ..	1810E	273	22	11,009	4·10	451·5	330	Sr. 4	297, 366 ..	Willow Park Banker 3rd
Deep Dale Peach ..	1813E	273	14	9,782	4·39	429·5	350	Mature	433 ..	Willow Park Revenue
Deep Dale Rachel ..	1816E	273	9	8,901	3·73	332·3	350	Mature	312, 339 ..	Willow Park Banker 3rd
Deep Dale Rachel 2nd ..	C.C.	273	9½	7,077	3·87	273·7	230	Jr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Renie ..	1817E	273	21	10,400	3·70	384·3	350	Mature	400 ..	Willow Park Banker 3rd
Deep Dale Star	1820E	273	18	8,970	4·70	421·2	330	Sr. 4	299, 301 ..	Willow Park Banker 3rd
Deep Dale Strawberry ..	1821E	240	4	7,035	3·70	260·0	310	Jr. 4	232, 396 ..	Willow Park Barrington 26th
Payne, A. E. T., Lilydale, Guernsey (4).										
Yarraview Beryl ..	8197	273	28	10,906	4·86	530·4	350	Mature	485, 560, 526	Honoria's Benefactor (Imp.)
Yarraview Clarabelle ..	8200	273	19	8,247	4·85	399·7	350	Mature	337, 403, 425	Honoria's Benefactor (Imp.)
Yarraview Essie ..	5169	273	32	10,982	5·33	585·7	350	Mature	292, 346, 583, 510, 513, 517	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Roulette ..	9789	273	20	7,577	5·98	453·2	250	Sr. 2	465 ..	Sun Rose of Maple Lodge (Imp.)
Phillips, J. H., Swan Hill, Jersey (4).										
Rylands Lavene	Vol. 29	273	20	7,197	4·78	344·1	250	Sr. 2	251 ..	Banaview Master
Rylands Mustella ..	C.R.	273	15	4,247	6·10	258·9	250	Sr. 2	293 ..	Banaview Master
Rylands Nanette ..	64160	273	26	9,362	4·76	445·7	350	Mature	236, 322, 350, 434	Orphanage Zaffarine Prince
Rylands Xmas Eve ..	Vol. 29	273	13	5,569	4·99	277·8	230	Jr. 2	.. ..	Banaview Master
Powell, T. S., Mansfield, Jersey (3).										
Carellen Air Maid 2nd ..	75603	273	9	6,584	5·48	361·0	250	Sr. 2	277 ..	Werribee Madeira's Ace
Carellen Dainty Maid 2nd..	Vol. 29	273	16	5,613	5·50	308·6	230	Jr. 2	.. ..	Mornmoot Magistrate 2nd
Carellen Stellar Princess 2nd	Vol. 29	273	10½	4,013	6·14	246·5	230	Jr. 2	.. ..	Werribee Planet
Read, Estate of the late J. D., Springhurst, Jersey (20).										
Springhurst Anemone's Duchess	73921	273	15	7,784	5·06	394·0	270	Jr. 3	339 ..	Glen Iris Anemone's Standard
Springhurst Ashley Narcissus	69122	273	5	6,299	5·71	359·5	290	Sr. 3	291, 341 ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Blonde Nardoo	59485	273	10	8,901	5·84	520·0	350	Mature	318, 488, 448, 519	Bellefaire Seaborn Successor
Springhurst Blonde Romneya	55272	273	20½	9,240	6·00	554·5	350	Mature	377, 399, 523, 463, 526	Bellefaire Seaborn Successor

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Read, Estate of the late J. D. Springhurst, Jersey—*continued.*										
Springhurst Boutillere ..	64270	273	24	9,729	5·04	489·9	330	Sr. 4	336, 424, 458	Glen Iris Anemone's Standard
Springhurst Brampton Tulip	64274	273	6½	9,545	4·54	433·3	330	Sr. 4	281, 263, 363	Glen Iris Anemone's Standard
Springhurst Coronation Narcissus	50625	273	9	6,366	5·92	376·7	350	Mature	317, 428, 429, 519, 585, 530	Springhurst Design's Analyst
Springhurst Phillidora's Alsyke	73928	273	11	7,346	5·42	398·4	270	Jr. 3	375 ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Pet Tomato ..	64282	273	16	7,429	4·75	353·2	350	Mature	344, 409, 473	Glen Iris Anemone's Standard
Springhurst Phillidora's Narcissus	73929	273	17½	8,679	5·00	434·0	250	Sr. 2	343 ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Phillidora's Romneya	78938	273	18	5,199	5·73	297·8	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Ronald's Alsyke	59498	273	20	10,215	5·55	567·4	350	Mature	365, 545, 435, 579	Bellefaire Seaborn Successor
Springhurst Ronald Duchess	64283	273	19	9,751	5·35	522·0	350	Mature	495, 549, 555	Springhurst Sybil's Successor
Springhurst Socurette's Alsyke	78941	273	18	6,357	5·62	357·5	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Socurette's Lily	69129	273	15½	8,814	5·38	474·1	310	Jr. 4	322, 391 ..	Bellefaire Superlative Pride
Springhurst Socurette's Tecoma	78942	273	20	6,266	5·29	331·6	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Socurette's Tulip	73931	273	23	9,348	5·37	501·8	270	Jr. 3	402 ..	Bellefaire Superlative Pride
Springhurst Sybil Tulip ..	55281	240	4	6,795	5·70	387·4	350	Mature	329, 425, 492, 513, 450, 469	Springhurst Golden Gamboge
Springhurst Volunteer's Nardoo	73934	273	14	7,790	5·75	447·7	250	Sr. 2	352 ..	Springhurst Tomatoe's Volunteer
Springhurst Xenia's Narcissus	64289	273	10	8,322	5·22	434·5	330	Sr. 4	229, 330, 437	Glen Iris Anemone's Standard
Reid, Miss B. B., Bundoora, Jersey (11).										
Jubilee Aquilegia ..	53392	273	8	5,769	5·48	316·4	350	Mature	.. ..	Jubilee Whalelight
Jubilee Auricuta ..	Vol. 29	273	9	5,059	4·91	248·6	230	Jr. 2	.. ..	Werribee Stylish Masterpiece
Jubilee Bramble	Vol. 30	273	6½	4,250	5·64	239·8	230	Jr. 2	.. ..	Werribee Stylish Masterpiece
Jubilee Deutzia	Vol. 29	240	4	4,057	5·76	233·8	230	Jr. 2	.. ..	Jubilee Datura
Jubilee Lapigeria ..	72010	273	9½	5,223	5·16	269·6	310	Jr. 4	.. ..	Jubilee Richlight
Jubilee Laurus	72011	273	6	4,263	5·30	225·9	350	Mature	302 ..	Werribee Stylish Masterpiece
Jubilee Libonia	62343	273	20	8,510	4·79	407·4	350	Mature	.. ..	Werribee Stylish Masterpiece
Jubilee Lime 2nd ..	57874	273	14	7,407	5·29	391·7	350	Mature	.. ..	Banyule Airo
Jubilee Tuberose ..	72017	273	4½	2,758	6·61	182·4	310	Jr. 4	.. ..	Jubilee Richlight
Jubilee Wild Rose ..	Vol. 29	273	11	5,439	4·45	242·3	230	Jr. 2	.. ..	Werribee Stylish Masterpiece
Jubilee Winterberry ..	76989	273	7	5,034	5·79	291·2	250	Sr. 2	.. ..	Jubilee Torchlight
Ross, D. M., Croydon, Dairy Shorthorn (4).										
Willow Park Comet 26th..	1656D	273	14½	8,730	3·40	296·9	250	Sr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 43rd	2046E	273	N.C.K.	6,087	4·17	291·4	270	Jr. 3	286 ..	Willow Park Barrington 58th
Willow Park Melba 38th..	2048E	273	N.C.K.	8,522	3·38	287·9	270	Jr. 3	265 ..	Willow Park Barrington 58th
Willow Park Melba 40th..	1688D	273	N.C.K.	7,698	3·20	246·3	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
St. Joseph's Home, Sebastopol, Jersey (2).										
St. Joseph's Design's Perree	Vol. 29	273	13	5,294	5·91	312·9	230	Jr. 2	.. ..	Selsey Design's Standard
St. Joseph's May ..	C.R.	273	13	4,781	5·84	279·3	230	Jr. 2	.. ..	Selsey Design's Standard
Sadler, R. W., Noorat, Ayrshire (2).										
Burnbrae Lyric	32017	273	N.C.K.	6,132	4·76	291·7	330	Sr. 4	.. ..	Kerlie Park Luminous
Oakbank Inspire ..	Vol. 35	273	N.C.K.	5,280	4·12	217·4	330	Sr. 4	.. ..	Oakbank Aboon
Shearman, A. and W., Darnum, Jersey (1).										
Darnum Park Buttercup..	C.R.	273	21	6,588	7·86	517·9	330	Sr. 4	429, 562 ..	Darnum Park Minnie's Boy
Stephens, Dr. F. G., Vermont, Guernsey (2).										
Vermont Frances ..	9560	273	16	6,252	5·27	329·4	250	Sr. 2	.. ..	Melbourne Golden Lodestar
Vermont Una's Princess ..	5188	273	33	10,376	4·47	463·6	350	Mature	339, 407, 279, 479, 333	Camilla's Majestic 2nd of Maple Lodge
Tait, W. G., Dreelte, Jersey (2).										
Stonybank Gaiety Girl 12th	78969	273	15	6,135	6·03	369·9	230	Jr. 2	.. ..	Mornmoot Marius 2nd
Stonybank Snowdrop 5th	73964	273	16	7,103	5·56	394·6	290	Sr. 3	288, 444 ..	Mornmoot Marius 2nd

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Tandberg, G., and Son, Warragul, Illawarra Shorthorn (2).										
Douglas Vale Peggy	Vol. 8	273	18¼	7,248	3·90	283·0	250	Sr. 2	253	Grange Lea Jack
Inverlair Bebe	8159	273	23½	9,761	3·46	337·8	350	Mature	201	Tango of Greyleigh
Teychenne and Ducret, Wesburn, Guernsey (1).										
Melbourne Golden Topsy	5877	273	26	7,670	4·87	373·4	350	Mature		Woodlands Fluer-de-Ly's (Imp.)
Tomasetti, B. G., Drouin West, Ayrshire (6).										
Emoh Ruo Angie	C.R.	273	17	7,191	4·12	296·3	250	Sr. 2		Emoh Ruo Excellent
Glencorren Edna	C.R.	273	17	8,558	4·54	388·8	270	Jr. 3	303	Glenfalloch Comrade
Glencorren Elva	32414	273	23	9,027	4·84	436·8	350	Mature	279, 384, 384	Scotswood Flashlight
Glencorren Emma	Vol. 35	273	10	5,469	4·80	262·7	230	Jr. 2		Glenfalloch Pilot
Glencorren Goldie	C.R.	273	14	5,489	4·91	269·5	230	Jr. 2		Glenfalloch Pilot
Glencorren Lady	34549	273	12	8,153	3·92	319·6	330	Sr. 4	274, 268	Glen View Sultan
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Carinya Briar Rose	Vol. 29	273	N.C.K.	6,831	5·40	368·8	250	Sr. 2		Ballara Ideal's Gadget
Carinya Miss May	Vol. 29	273	N.C.K.	4,326	5·74	248·5	250	Sr. 2		Ballara Ideal's Gadget
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Hylsbroke Air Lady 5th	76879	273	24¼	7,274	5·39	392·1	290	Sr. 3	347	Banyule Mollison
Hylsbroke Air Lady 10th	Vol. 29	273	18	5,964	5·06	301·9	230	Jr. 2		The Wattles Young Gamboge
Hylsbroke Goldfinch	67052	273	20	9,130	5·67	517·7	350	Mature	428	Latrobe Dante
Hylsbroke Jolly Lassie 2nd	67054	240	4	5,100	5·92	302·1	350	Mature	441	Latrobe Dante
Hylsbroke Jolly Lassie 9th	Vol. 30	273	15	5,975	4·95	295·8	230	Jr. 2		The Wattles Young Gamboge
Hylsbroke Joy Step	48733	273	10¼	4,922	5·58	274·7	350	Mature	415	Joystick of Banyule
Hylsbroke Larkspur 2nd	67056	273	17	6,893	6·28	433·1	350	Mature	386	Latrobe Aircloud
Hylsbroke Marina	57737	240	13	5,985	5·49	328·8	350	Mature	450	Latrobe Starjoy
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The Hollies Fancy 3rd	Vol. 30	273	11	4,450	6·04	269·0	230	Jr. 2		Gadget (Imp.)
The Hollies Happy	Vol. 29	273	N.C.K.	4,812	5·19	249·6	230	Jr. 2		The Hollies Chief
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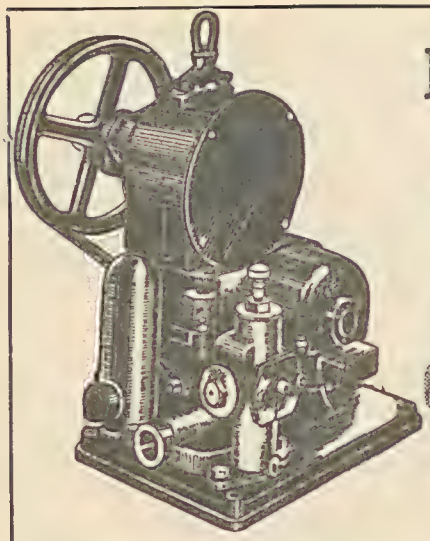

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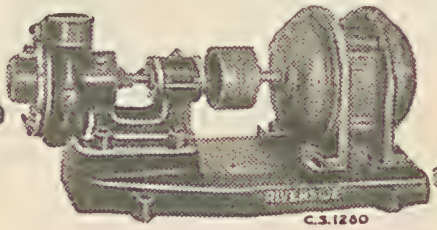

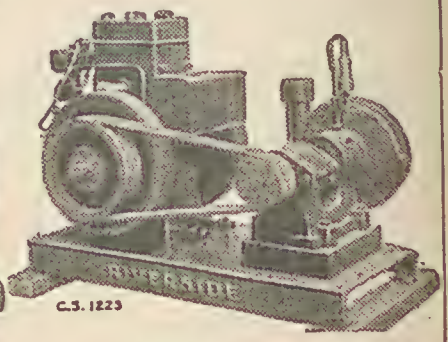

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Maintenance of Soil Fertility and Production

By R. H. HAYMAN, B.Agr.Sc., Science Field Officer, Rutherglen Experiment Farm

RESTRICTED supplies of superphosphate, combined with the urgent demand for increased production of meat and dairy products necessitate careful planning and farm management.

In the following article some results of ten years' experimental work at the Rutherglen Experiment Farm are described to show how farming practice in areas experiencing similar climatic conditions may be improved by the establishment of subterranean clover pastures, clover-lay farming, and the abandonment of the "cropping paddock" idea. From the results of these experiments conclusions are drawn as to the best methods of using the available fertilizer ration to maintain production of meat and conserved fodder, and fertility of the soil.

Since the outbreak of war the farmer has been faced by a difficult three-fold problem. Supplies of skilled labour have been seriously depleted by enlistments, man-power requirements, and the drift to better paid work in munitions and armament factories. Fertilizers, chiefly superphosphate, on which he had come to rely as the main means of improving crop and pasture yield, have been severely rationed,

Ewes and fat lambs grown on subterranean clover at Rutherglen.

Mowing a heavy clover pasture at Rutherglen.

and coupled with this setback there had come a call for more meat, more dairy products and more conserved fodder for use in lean periods.

The successful maintenance of soil fertility, with maximum live stock and fodder production under these adverse conditions, calls for a high degree of farming skill and careful farm management, particularly with regard to the wisest use of available supplies of fertilizer.

Results obtained from carefully controlled experiments at the Rutherglen Experiment Farm, conducted over a number of years and given below, provide valuable information as to how these problems may be met.

Under conditions embracing a 22½-in. rainfall and a mild climate with a dry summer, a system of farming has been evolved under which profitable crops may be grown on non-fallowed clover-lay land even without the use of superphosphate when sowing the crop. The superphosphate saved thereby may be better used to top-dress subterannean clover pastures, thus maintaining them at a high level of production, and at the same time improving soil fertility for subsequent cropping.

In 1931, a long-term experiment was commenced to compare subterranean clover-lay pastures sown on an old cropping paddock with volunteer-lay pastures self-established on the same paddock, both as a pasture and as means of restoring fertility to the soil, which had been under cultivation for many years previously.

Portion of a paddock cropped for a number of years, and which carried stubble at the time, was divided into four blocks of equal area; two blocks were sown to subterranean clover (3 lb. per acre) and Wimmera rye grass (6 lb.) with a cover crop of oats. The remaining blocks were left to grow volunteer pasture. The rest of the paddock was maintained under cultivation.

The subterranean clover and rye grass pasture, favoured by good early rains, established itself rapidly and had produced a good sward by the end of 1932. In later years the rye grass practically disappeared from the pasture, leaving an almost pure clover sward. A feature of the clover pasture was the almost complete absence of Cape weed, which was very prominent in the composition of the adjoining volunteer or "natural" pasture. The volunteer pasture was very slow to establish itself and during the first two years consisted of a thin stand of barley grass, silver grass, and Cape weed. Later, a number of small annual clovers and trefoils appeared, and the pasture thickened up and was capable of providing moderate feed during the winter and spring months. It then dried off rapidly in the spring and provided practically no feed over the summer, in contrast with the clover pasture, the burr from which provided good summer feed.

Both pastures were lightly grazed in 1932, and normal grazing commenced in 1933. After establishment they were regularly top-dressed with ¾ cwt. superphosphate per annum. From 1933 to 1936 inclusive both pastures carried dry sheep, which were replaced in 1937 by ewes, with 100 per cent. lambs at foot, both types of pasture being stocked at 2·5 ewes per acre.

During the four years when dry sheep were grazed the subterranean clover pasture carried an average of 2·2 sheep per acre, and the volunteer pasture 1·6, and increase of 38 per cent. in favour of the subterranean clover pasture.

In 1937 the number of ewes carried on both types of top-dressed pasture was the same—2·5 per acre—with 100 per cent. lambs, but the lambs produced on the subterranean clover pasture were heavier by an average of 7·8 lb. frozen weight, and were of better quality. The

figures clearly show the superiority of the subterranean clover pastures as compared with volunteer-lay.

TABLE 1.—COMPARISON OF THE FROZEN WEIGHT AND GRADES OF LAMBS RAISED ON SUBTERRANEAN CLOVER AND VOLUNTEER-LAY (NATURAL) PASTURES.

Pasture Type.	Ewes and 100 per cent. Lambs per acre, 1937.	Average Frozen Weight of Lambs.	Percentage of First Grade Lambs.
Volunteer-lay ..	2·5	32·8	50
Sub. clover-lay..	2·5	40·6	100

In 1938, in order to measure the increase in soil fertility brought about during the period under clover and volunteer-lay, as compared with the adjoining area of the paddock which had been maintained under cultivation, wheat plots were sown on each of the four pasture blocks, and on an adjacent area of the paddock which had been regularly cropped since the pasture blocks were established and fallowed in 1937. In order to obtain information as to the necessity or otherwise of fallowing lay land before sowing, portion of each of the pasture blocks had been fallowed in the spring of 1937. A manurial trial was also incorporated in the experiment.

Thus, in 1938, results were obtained from different manurial treatments on adjacent areas of the same paddock which, since 1915, had had the following history:—

(1) Cultivated, 1915-1930; volunteer pasture, 1931-1937; fallowed, August, 1937.

(2) Cultivated, 1915-1930; subterranean clover pasture, 1931-1937; fallowed, August, 1937.

(3) Cultivated, 1915-1930; volunteer pasture, 1931-1938; plowed and sown immediately.

(4) Cultivated, 1915-1930; subterranean clover pasture, 1931-1938; plowed and sown immediately.

(5) Cultivated, 1915-1938; fallowed, August, 1937.

The wheat plots on the blocks with this varying history were sown late in May, 1938.

The results of the experiment are given in Table 2.

1938 wheat plots on land rested in pasture since 1931. Left—Wheat after natural pasture. Right—Wheat after subterranean clover and Wimmera rye grass established with the last cereal crop (oats) in 1931. Note the heavier crop of wheat following the clover.

A 3-ton per acre crop of oats growing on clover-lay land.

TABLE 2.—EFFECTS OF SPELLING LAND IN PASTURES OF THE FOLLOWING WHEAT CROP.

Wheat Yield in Bushels per Acre.

Previous Treatment.	No Manure.	Superphosphate (Average all Rates) ¾ cwt. per Acre.	Average Increase due to Manure.
1. After natural pasture (fallowed)	14·0	19·6	5·6
2. After clover pasture (fallowed) ..	20·7	24·3	3·6
3. After natural pasture (not fallowed)	12·4	12·7	0·3
4. After clover pasture (not fallowed)	21·1	24·4	3·3
5. Regularly cropped land (fallowed)	10·7	14·1	3·4

Soil analyses showed that much nitrogen had been accumulated in the spelled land, particularly that sown with subterranean clover, and the crops grown thereon were very thick in comparison with those grown after volunteer-lay or on regularly cropped land.

The effectiveness of subterranean clover pasture in raising soil fertility is well demonstrated by the fact that, with or without manure, yields from the clover plots doubled those obtained from plots regularly cultivated. Had the rainfall been normal, the increases would have been greater still, but the effect of fallow would have been less.

The main information obtained from the experiment and which has been substantiated by other experiments at the farm, one of which will be described later, is as follows:—

(1) A cultivation paddock, sown to clover-lay, and grazed for several years, will on its being returned to crop give much higher yields than if it had been maintained in cultivation during that time.

(2) These higher returns can be obtained without the use of superphosphate when sowing the crop (as may be necessary when superphosphate is scarce).

(3) It is more profitable to sow subterranean clover on a paddock which is to be turned out of cultivation than to depend on volunteer pasture. Grazing returns are higher, and crop yields are better when cultivation is resumed.

Second Experiment

The following experiment provides additional data, which confirms that obtained from the earlier one described above.

Two adjacent paddocks at the farm had been under cultivation since about 1913, having only occasional spells under grass.

In 1928 one of these paddocks was divided in two, one-half being sown down to subterranean clover pasture, and the other being retained under cultivation.

In 1937, wheat and oat manurial trials were sown on these paddocks—now three in number—which had had the following history:—

A. Regularly cultivated paddock, 1913-1928; clover pasture, 1928-1937; plowed and sown, June, 1937.

B. Regularly cultivated paddock since 1913; fallowed 1936; sown June, 1937.

C. Regularly cultivated paddock since 1913; wheat crop 1936; sown on stubble June, 1937.

The yields obtained are set out in Table 3, and again show a marked increase on the clover-lay ground as compared with the adjacent stubble and fallow.

TABLE 3.—COMPARISON OF WHEAT AND OAT YIELDS AFTER CLOVER-LAY, ORDINARY FALLOW AND STUBBLE.

—	No Manure.	Super. ½ cwt.	Super. 1 cwt.
WHEAT.	bus./ac.	bus./ac.	bus./ac.
Wheat after clover ..	26·2	34·5	37·0
Wheat after fallow ..	14·0	26·1	29·4
Wheat after stubble ..	9·5	12·6	14·2
OATS.	cwt./ac.	cwt./ac.	cwt./ac.
Oats after clover ..	56·2	64·7	67·2
Oats after fallow ..	39·6	59·9	68·2
Oats after stubble ..	21·6	27·1	26·0

Considering the figures for grazing (paddock "A" in this experiment maintained approximately two ewes per acre while under pasture), in conjunction with the crop yields shown in Tables 2 and 3, it is obvious from the foregoing experiments that greater returns are to be made from a farm on which the "cropping paddock" has been eliminated, and on which a system has been established, whereby old, regularly cropped paddocks are turned out to subterranean clover pasture while pasture paddocks are brought under cultivation for one or two seasons, and then allowed to revert to subterranean clover for a further period.

Subterranean clover is readily established on cultivated land, and can be sown with a cover crop of oats and a light dressing of superphosphate. Experience at Rutherglen has shown that further top-dressing is not warranted until the pasture has become established in its second year.

After this time, regular top-dressing should be commenced.

Experiments conducted at the farm show that, on established pastures, while maximum results are obtained by top-dressing annually, almost equally payable results are obtained by applying an equivalent dressing of manure every second year.

The quantity of clover seed sown is generally 2 to 3 lb. per acre, but if a more rapid establishment of pasture is required more seed can be sown. A method in use at the farm, and

A poor, thin crop growing on "worked out" soil in experimental plots at Rutherglen.

Heavy growth of clover pasture at Rutherglen Experiment Farm.

which could be readily followed on any farm where there are established clover pastures, is to sweep up burr from the pasture in January. This material, although too rough and stemmy to sow through a drill, can be broadcast over a paddock prior to sowing a cereal crop, and will establish a satisfactory pasture in about the same time as commercial seed, sown with a cover crop. The burr may be swept up and distributed very cheaply—cost of the two operations on the farm, estimated on the seed content of the burr—is less than 6d. per lb. of seed.

By this means, the whole arable area of a farm may be sown down to highly productive pasture, which, while it is increasing the production of stock, is also building up soil fertility. Cropping can then be done on those paddocks, which should be broken up in rotation, cropped for one or two seasons, and then allowed to revert to pasture. No difficulty has been encountered at Rutherglen in the voluntary re-establishment of clover pasture after two years of cropping. Ample clover seed remains in the soil during that time, and it germinates readily when the paddock is left out in the autumn.

Paddock "A", which in 1937 and 1938 grew two heavy crops, after having been under subterranean clover for nine years, was allowed to revert to pasture in 1939. In an admittedly good pasture year approximately 300 tons of silage, and 100 tons of clover hay, were harvested from the 70-acre paddock.

Although higher yields have been obtained in some seasons by fallowing lay ground before sowing, in preference to sowing straight from lay, the cost of working the fallow, to which must be added the value of pasture lost during the fallow period—which frequently includes the spring flush of growth—will more than offset the slight increase in yield obtained from it. The crowding of a whole season's cultivation into the autumn period may be considered a drawback in the adoption of a clover-lay system of farming. However, the reduced area which needs to be handled for the same return, in comparison with ordinary fallow farming, will offset this to some extent. Another factor is that clover-lay land, due to its friability, is easy to work, and if the pasture has been closely grazed, portion of the work of cultivation can be done with a scarifier.

Results of experiments at the Experiment Farm have shown that in normal seasons the use of a scarifier on clover-lay ground does not materially decrease the yield of crops, as compared with those grown on ploughed land. The exception appears to be the occurrence of a dry spring, when it has been noticed that crops growing on the scarified land suffer more from the competition of the clover plants left growing by the scarifier at seeding time than in normal years, and give considerably lower yields.

Table 4 shows yields of cultivation experiments conducted on clover-lay ground.

Table 4.—Cultivation Experiments on Clover-lay Ground.

Treatment.	Good Seasons (Average 1937 and 1942).	Dry Seasons (Average 1940 and 1941).
	bushels.	bushels.
Ploughed 5 in. and harrowed ..	37·5	14·2
Ploughed 3 in. and harrowed ..	38·0	13·0
Disced 3 in. and harrowed ..	36·8	8·9
Scarified 3 in. and harrowed ..	38·5	7·5

The experiments were conducted over the years, 1937-1942 inclusive. In two of these years—1938 and 1939—plots were not sown, due to lack of a suitable site in 1938, and to heavy floods in 1939. Of the remaining four seasons 1937 and 1942 were fairly good for crop growth, while 1940 and 1941 were extremely dry. The figures from the two good years show no significant difference in favour of any one treatment, but in the seasons in which the crop suffered from excessively dry conditions yields were much increased following ploughing.

Provided the land has been hard grazed, and contains sufficient moisture, no difficulty has been experienced in using a scarifier or disc. The greater speed at which these implements work, and consequently greater area which can be sown by their use, largely offsets the occasional drop in yield which an adverse season may cause in the ensuing crop, and it should be sound practice to work at least portion of the area to be sown from lay with these implements.

The manuring of crops sown on lay land is a problem, which, at present, must be viewed in the light of greatly restricted supplies of superphosphate. While crop yields on lay ground do show a response to superphosphate, quite good crops can be grown without superphosphate when the preceding pasture has been top-dressed.

Examination of the figures in Tables 2 and 3 shows that crops grown on clover-lay ground without the use of manure will equal in yield those grown on ordinary fallow with a standard dressing of superphosphate.

From the point of view of crop production, therefore, it should be possible to maintain yields on clover-lay land without using any of the superphosphate ration available, the whole of which can then be used direct on the pastures early in the autumn.

Despite the radical changes in practice embodied in the system of clover-lay farming, the evidence obtained from the foregoing experiments, supported by practical experience obtained at the Experimental Farm, indicates that with the reduced quantities of manure available, production may be maintained at a higher level under this system than is possible with ordinary fallow and stubble farming.

The elimination of fallowing means that extra paddocks are available for grazing, facilitating the carrying of extra stock, or the better maintenance of those on hand, even though supplies of fertilizer may be insufficient to enable all pasture paddocks to be adequately top-dressed. The paddock sown to crop need not be lost as a grazing proposition for that season. If oats are sown they will provide an abundance of autumn and winter feed and many ewes and lambs can be grazed on them, the pasture paddocks being spelled for grazing later in the season.

The rest given to the pasture paddocks at this time of the year is highly beneficial to the clover, which is enabled to establish itself firmly, and provide heavy grazing during the spring months, and an abundance of burr for dry feed during the summer. The oat crop, allowed to grow during the spring, can be cut for hay or stripped for grain to provide reserves of fodder for use in bad seasons.

If sufficient growth is made, some pasture paddocks may be reserved for pasture hay.

If the farm economy demands, and the price is payable, wheat may be grown on the lay ground; but oats are more useful as a reserve of fodder to be used for cattle or sheep.

Conclusion

(1) As insufficient superphosphate is available for all normal practice, consideration should be given, in mixed farming areas with a medium rainfall, to the use of the ration to top-dress the pastures rather than to sow with a cereal crop.

(2) The above procedure may be economically advisable if a system of clover-lay farming is adopted.

(3) If the required cereal crop is grown on clover land, previously top-dressed, satisfactory yields of hay or grain should be obtained, without manure and without fallow.

(4) Omission of the fallow area renders increased areas available for grazing. This is important in view of the need to maintain meat production.

Rye Corn and Sand-drift Control

By G. BLACKBURN, B.Agr.Sc., Science Field Officer, Mallee Research Station, Walpeup.

RYE corn is at last winning well deserved publicity for its value in controlling soil erosion. This cereal has demonstrated its use for this purpose at the Mallee Research Station, and in the last few years the sowing of rye corn has extended eastward from South Australia, where many farmers recognize the value of this hardy plant. Officers of the Mallee Research Station have had many reports of how this cereal is winning popularity in most districts of the Mallee. According to all reports there will be quite a considerable increase in the area sown to rye corn this year, both for feed and for drift control purposes. The State Rivers and Water Supply Commission for several years past has used rye to protect certain portions of its channel system from drift sand. This year the Commission intends sowing rye on as many drifty places along its channel as possible.

Rye, or rye corn as it is also known, is a hardy cereal, with tall, tough straw. On account of this quality, the straw is used for thatching and filling horse collars. The grain is small and uneven in its colour. A limited market exists in Australia for rye to be made into ryebread—a staple food in many parts of Europe, but regarded by many Australians as a fancy bread.

Experience has shown that rye can establish itself on wind-blown sandhills where oats or wheat has failed. It grows even better on loose sand banks, whose liability to drift often makes it impossible for wheat or oats to obtain a hold in the sand. Rye, however, grows rapidly once it is established and quickly shoots up into head in spring, giving excellent protection to exposed soils or sand banks.

Early this year the Department of Agriculture sent questionnaires to some 50 Mallee farmers who had bought rye seed from the Mallee Research Station in 1942. A very large proportion of these farmers sent replies, thus enabling the Department to learn much more about the use of rye in controlling drift. The wide approval of rye for use in drift control was shown by the fact that only one farmer considered oats to be more useful than rye for this purpose. More than half of the farmers who answered the questionnaire had grown rye and other cereals under similar conditions, and only one of these considered that the other cereals made better growth than rye.

Many of the farmers had grazed the rye, some because they were not able to fence it off from stock, and others because they were anxious to test its use for feed. Several of the farmers concerned intended using rye seed harvested by them for growing feed this year. Such a practice has much to commend it, although there is a slight risk of rye spreading into areas sown for wheat. Experiments at the Mallee Research Station have shown that rye gives more feed than any other cereal, but a mixture of rye and oats would be more suitable for providing good early feed as well as late feed.

Although it gives a greater bulk of growth than other cereals, rye is deceptive compared with wheat in its grain yielding ability. Compared with wheat, rye may be considered to yield half as well on good ground; but may yield as well as or better than wheat on lighter soils. The average yield of rye obtained by 21 farmers last year in different parts of the Mallee was 4½ bags per acre.

Rye has a bushel weight of approximately 60 lb., but, on account of its small grain size, it can be sown at a lower rate than wheat. A rate of sowing of 35 lb. per acre, roughly one bag of rye to 5 acres, will give a thickness of sowing ample for drift control purposes, although this would not be heavy enough to give the maximum grazing value. Rye should be sown as early as possible for drift control, but because of the lateness of the present season it can still be sown with advantage for control of sand movement during the spring dust-storms.

— — SPIES LISTEN WHILE FOOLS CHATTER — —

NITROGEN *for* Fruit and Vegetable Production

. . . Nitrate of Soda now available

By G. W. GAYFORD, B.Agr.Sc., Assistant Horticultural Research Officer

FRUIT-GROWERS realize the value of artificial fertilizers in maintaining production, and have felt some concern because of the shortage of these materials. Artificial fertilizers containing nitrogen have been in particularly short supply. The most popular and valuable nitrogenous fertilizer, sulphate of ammonia, is reserved for the production of vegetables, potatoes and citrus fruits, all of which are in high priority for defence and civil needs. Fruit-growers have been unable to obtain sufficient nitrogenous fertilizers, and for this reason the growing of leguminous green crops was advised in order to supplement the nitrogen supply in the soil.

Nitrate of soda is a satisfactory fertilizer for cabbages.

To meet the deficiency, the Federal Government has arranged for the importation of nitrate of soda, a valuable fertilizer used commonly in many parts of the world, and supplies will be available in the near future for use on the orchards in the late winter and early spring. The rations will be allocated by the Fertilizer Section of the Department of Agriculture.

Spreading artificial fertilizer in the orchard.

In comparison with sulphate of ammonia, which contains 20·5 per cent. nitrogen, nitrate of soda contains 15·5 per cent. As the price of these two fertilizers has been fixed at £18 10s. per ton, f.o.r., Melbourne, the cost of nitrate of soda per unit of nitrogen is slightly greater than sulphate of ammonia. However, as nitrate of soda may be up to 10 per cent. more efficient than sulphate of ammonia, this difference is not very important now.

Before nitrogen becomes available to the plant it must generally be in the form of nitrate, in which form it can be directly absorbed by the roots. The nitrogen in sulphate of ammonia is in the form of ammonia and as such it must be converted into nitrate by

soil organisms before it becomes available to plants. This process may take a week or ten days, and in cold weather, much longer. On the other hand, the nitrogen content of nitrate of soda is available immediately, no intermediate soil process being necessary. The advantage in using nitrate of soda as a dressing for leafy vegetable crops during the winter can thus readily be seen. It can be seen, also, that heavy applications of nitrate of soda may cause damage to trees or plants by reason of its rapid action.

Nitrate of soda is very soluble in water, and, unlike sulphate of ammonia, which may be immobilized in the soil for some time, it may be washed out by rain or irrigation water. This loss would be most extensive on light, sandy soils. If very heavy dressings are used, a large proportion of that applied may be washed right out of the root zone before it can be used. In order to obtain the most effective use of supplies of nitrate of soda, two or more applications of small quantities should be used instead of a single large application.

Nitrate of soda when used repeatedly on soils already high in sodium will increase the alkalinity of the soil and make the clay sticky, difficult to cultivate and irrigate. In Victoria, soils likely to behave in this way occur in the Murray Valley area west of Echuca, but even in these districts nitrate of soda could be used for one or two years without danger of the soil deteriorating, except that it should not be used at all on patches where the trees or vines already show the effects of unfavourable soil conditions. If used for longer periods there may be some danger of trouble occurring. For the rest of the State, nitrate of soda should prove a satisfactory fertilizer.

Time and Rate of Applications

For fruit trees, an application of nitrate of soda should be given in the spring just before flowering. Two lb. per tree (approximately 2 cwt. per acre) applied at this time, followed a month later by a further application of 2 lb., would provide a satisfactory dressing for a mature deciduous fruit tree. For citrus the total application may be increased with advantage to 8 lb. per tree spread over several dressings. It is quite possible that the allowance to each grower will not permit of such dressings over the whole of the property. In this case, it would be better to concentrate the allowance on the area likely to show the best return, i.e., on most profitable varieties, or on a section showing some decline because of the already reduced nitrogen content of the soil. For vines, 2 to 4 cwt. per acre in the August-September period would be an adequate dressing, subject to restrictions by soil type as discussed earlier. Two separate applications of 2 cwt. per acre may be applied to berry fruits. Applications of less than 1 cwt. per acre of nitrate of soda are not likely to show any effect.

Because this fertilizer is very soluble, the method of application is not important because rain or irrigation water would quickly wash it into the root zone. However, the first spring application may be distributed on the green crop and ploughed into the soil where it will be of some value in hastening the decomposition of the crop.

Nitrate of soda is an excellent fertilizer for leafy vegetable crops, particularly cabbage, cauliflower, spinach, silver beet, early onions and lettuce. It should be applied as a side dressing after the young plants are six to eight weeks old. Some care must be exercised in the use of nitrate of soda on Brussels sprouts, otherwise the rapid growth will cause the sprouts to become "blown." A further application of nitrate of soda within two to three weeks of maturity of cabbage crops will result

Silver beet also responds readily to nitrate of soda.

[Continued on page 343.

Some Diseases of Young Cattle

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

Each calf should have its own feeding bucket.

CONDITIONS at present call for a maximum production of both milk and its by-products, and also of beef. It naturally follows that any disease condition affecting young cattle, and resulting either in death or unthriftiness, represents a serious economic loss to both the individual owner and the community. Where death does not occur, the time and labour involved in nursing and treating the sick animal represents a serious drain on the limited man-power available. These disease conditions however can often be controlled by attention to hygiene, and, in some cases disease can be prevented by calfhood immunization. This latter method, in particular, is strongly recommended, representing a direct financial saving, as well as a saving of man-power.

SCOURS IN CALVES

1. "*White Scours.*"—The term "white scours" indicates the chief symptom of a serious disease in young calves, which is common in the dairy herds of this State. It is a form of diarrhoea occurring usually within two to three weeks after birth, and is due to organisms of the Colon type. Infection usually takes place by way of the mouth, but an unhealed navel may afford a means of entrance. The disease runs a fairly rapid course, and is fatal in a large percentage of cases. In some instances, where recovery does occur, secondary infection, i.e., arthritis, may arise. Surviving animals remain weak and stunted for a considerable time.

Symptoms may occur within a short time after birth, or may not develop for ten or twelve days. A very profuse liquid diarrhoea is set up, generally yellowish-white in colour, often curdy or frothy, and sometimes blood-stained. The faeces are generally offensive in odour, and their passage is accompanied by straining, grunting or moaning. Emaciation is rapid. The tail region becomes badly soiled, and the calf presents a miserable picture; eyes sunken, belly tucked up, back arched, hair stiff and dry, &c. The temperature is raised early, but as the condition progresses the temperature may become sub-normal, as evidenced by a coldness of the extremities.

2. "*Blood Scours.*"—In older calves, diarrhoea with foetid blood-stained faeces may develop. This condition is commonly known as "blood scours" and is due to enteritis caused by bacterial infection. As the condition develops, a picture resembling that described above is presented.

Treatment

Treatment consists firstly in the isolation of the sick calf to prevent the spread of infection. They should be placed in clean, bright, well-drained and well-ventilated, dry surroundings, or in sheltered, well-drained yards or paddocks. All food should be withheld for one or two days, and a liberal supply of cooled boiled water given every four hours. In some milder cases, this will be sufficient to remove the irritating material causing the diarrhoea, and recovery occurs. In other cases, particularly in older calves, it is advisable to dose with castor oil (1 to 3 oz. according to the size of the calf) in an attempt to remove the irritating material, which often consists of undigested clots of milk. This should be followed with an internal antiseptic. Perhaps the best to use would be formalin, which, besides being an intestinal disinfectant, also prevents bloating. The dose according to size is ½ to 1 teaspoonful given in ½ pint of boiled milk. This can be repeated daily. If the diarrhoea still persists, astringents such as bismuth subnitrate 1 dram, gum arabic 1 dram in boiled milk given three times daily, *or* powdered opium 5 grains, catechu 1 dram, and prepared chalk 1 ounce, given in gruel twice daily, may be administered.

Prevention

Prevention, however, provides a much better line of defence than does curative treatment, and is more likely to yield better results. It consists in the first place in care and attention at the actual time of calving. In this respect, under Australian conditions, good clean pasture will provide the necessary hygienic surroundings.

On properties where the disease is known to exist, the navel of the calf should be ligatured and disinfected with tincture of iodine at birth or as soon after as is possible. The most important line of control, however, is the care which must be given to the nutrition of the newly-born calf. It requires, and should get, its own mother's milk for at least the first few days. This first milk or colostrum has laxative properties, and, in addition, contains elements which assist the calf in resisting disease during its early life. Not the least important of these elements is the relatively high vitamin A content. Whole milk should be fed for the next few weeks. Separated milk should not be fed to the calf until it is three to four weeks old. The change from new to separated milk should be gradual, and a substitute for the cream removed by the separator should be provided. For this purpose 1 to 2 oz. daily of pure cod liver oil is probably the best. If cod liver oil is not obtainable, the use of Apsolene or other similar fish liver product will prove satisfactory. The calf should not be over-fed, and all milk should be fed at blood heat. More care in the frequency and amount of the feeds will do much to prevent digestive disorders. All feeding buckets should be scalded after each meal and preferably hung up in the open exposed to sunlight.

The newly-born calf is susceptible to cold, and this necessitates the provision of adequate shelter. This usually takes the form of more or less permanent calf sheds and pens.

Essential points to be considered in the construction of calf sheds are :—

1. They should be bright, airy and dry.
2. An impervious floor is essential, and the floor must be given sufficient fall for drainage. Disinfection and general cleanliness are thus rendered easier.
3. Plenty of bedding to provide a warm, dry bed in winter and a cool one in summer should be provided, and soiled bedding must be replaced regularly and frequently.

Calf pens or yards should be sufficiently roomy to provide plenty of exercise. They must be located so that they are not contaminated by drainage from other paddocks or existing sheds, i.e., cow sheds, pig sties, &c. The provision of a feeding rack to contain good quality meadow hay is desirable as this will tend to obviate any tendency to eat bedding. There should be a readily accessible supply of good fresh water.

Minerals are necessary for all growing animals, and milk alone, particularly when separated, does not contain a sufficiency of minerals for normal growth and development. To a large extent any mineral deficiency is overcome when the calf starts feeding on pasture, and this will be further aided by the provision of a suitable mineral lick such as dicalcic phosphate, bone meal or bone flour 1 part to salt 4 parts. While being bucket fed, the addition of limewater to the milk at the rate of 1 dessertspoonful to 1 quart is of distinct advantage. Carron oil, which is made by mixing equal parts of limewater and raw linseed oil, may also be used.

It must be stressed that calves are born healthy, and that the relatively high rate of mortality is due, fundamentally, to errors in feeding and management, and, as such, are preventable. This particularly applies to "scours" for outbreaks are intensified under conditions of bad management and poor hygiene.

RINGWORM IN CALVES

Ringworm is a disease of the skin which may attack any domesticated animal, and also man. It is most frequently seen in young animals such as calves or yearlings which are in poor condition. The disease is contagious, and is caused by fungi of the family *Trichophyta*. These fungi consist of growing threads or hyphae, and have the powers of forming spores which are very resistant and may retain their power of germination for months.

Infection results usually from direct contact of healthy with affected animals, or it may occur in sheds or pastures through the medium of posts, &c., against which affected animals have rubbed themselves.

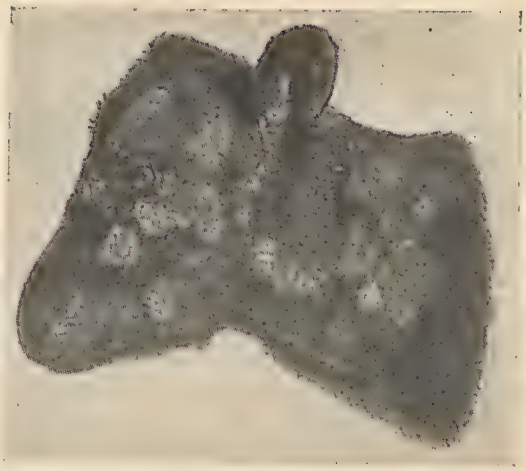
Lesions most commonly occur about the head, face and lips, eyelids and neck, although they may be found on any part of the body. The lesion commences as a raised ring-like patch on which the hair becomes at first erect, and later breaks off. This is due to the fungus becoming established at the base of the hairs. As a result of its penetration, epithelial scales become heaped up to form greyish-white or greyish-yellow crusts. The lesions are usually numerous and extend to the size of a five-shilling piece. They may become confluent, in which case quite large areas are involved. These crusts are at first firmly adherent, and, if forcibly removed leave a raw bleeding surface. If left alone, the crusts become raised by a slight purulent discharge, and may later be shed. The bare skin then exposed has a thickened and wrinkled appearance. The discharge on the bare patch often dries and forms a thin scab under which healing takes place, followed by a subsequent growth of new hair.

In adult cattle there is, as a rule, no systemic disturbance, but in badly affected young stock, general unthriftiness is set up. The degree of irritation is variable, but in the majority of cases calves tend to rub themselves against gate posts and other obstacles, and thus set up centres of infection and re-infection. So, through lack of attention, ringworm may assume a chronic character.

Treatment

Affected animals should be isolated. Calf pens &c., from which affected animals have been taken should be thoroughly disinfected, particular attention being paid to the woodwork. Lime-wash containing carbolic acid, ½ pint to the gallon, may be used, and is most effective if applied hot.

Curative treatment in most cases is both simple and effective. The hair should be clipped from around the affected parts, and the crusts and scales removed. This may be done more easily if they are first softened by applications of olive oil. They may then be washed off with warm soapy water to which washing soda has been added. All debris removed should be carefully burnt.



Calf with ringworm.

[After *Wooldridge*.

Having cleaned up the affected parts and dried them, the lesions must be dressed with a parasiticide, of which there is a considerable choice. Probably ordinary weak tincture of iodine (2½ per cent.) makes the best dressing. Other suitable dressings are—equal parts of sulphurous acid and glycerine; 1 part creosote to 7 parts raw linseed oil; 2 per cent. solution of formalin in water. Mercuric preparations such as mercuric ointment or corrosive sublimate are also very effective. These should not, however, be applied over large areas as calves are liable to be poisoned by mercury. Whatever method of treatment is adopted, it is important to remember—

1. That all diseased hair must first be shed or forcibly removed.
2. That a liberal diet is necessary.
3. That man can contract this disease from cattle. The attendant, therefore, should wear overalls while dressing an animal, and should disinfect his hands and arms afterwards.

BLACKLEG IN CATTLE

Blackleg is an acute infectious disease affecting, chiefly, cattle between the ages of six months and two years. Younger and older cattle however, may be affected, and sheep of all ages are also susceptible. The disease is enzootic in nature, being more or less restricted to certain well-defined areas. Even in these areas the infection

may be restricted to certain portions or even paddocks. River flats, low-lying pastures or swamps, &c., are often particularly dangerous.

Blackleg is caused by a bacillus—*clostridium chauvei*—which is an anaerobe : that is, it cannot exist in the presence of oxygen. The bacillus has the power of forming spores and these spores can remain viable for years. Contamination of pastures is greatly increased when infected carcasses are cut up or are not properly disposed of.

Animals do not infect each other directly, but pick up the infection from the soil, either by swallowing infected food or water, or by contamination of a wound.

Symptoms

The period of incubation is usually about three days, and the disease runs a rapid course, death ensuing in from 12–48 hours. In many cases, no symptoms are noticed, the infected animal being found dead. When symptoms are seen, a sick animal often shows a lameness generally restricted to one hind leg. The animal separates itself from the rest of the herd, refuses to feed, and rumination ceases. The temperature is raised, being from 104 to 107 degrees, and the animal goes down. There is a blowing respiration often accompanied by grunting. On close inspection, a local swelling may be discovered—most often in the upper part of the hind limb in which lameness was apparent. This swelling, however, may appear wherever there is a muscular mass, i.e., in shoulders, loins, chest, neck, &c. It is at first small, hot and painful, but rapidly extends, involving a larger area. Later the swelling becomes cold and insensitive. The skin in the area becomes hard and dry, and there is often a sharp line of demarcation between the diseased and healthy tissues. On manipulation, the swelling is found to be gas-filled and a peculiar crackling sound like the rustling of stiff paper is heard. This is due to the presence of gas in the swelling, the gas being formed in the tissues by the causal bacillus. As the condition progresses, the breathing becomes more laboured, the animal becomes prostrate, the temperature falls to normal or sub-normal, and death soon follows.

Post-Mortem Lesions

The characteristic lesion of blackleg is the gas-filled swelling which crackles on manipulation. If the lesion is cut, the muscles and other tissues are found to be dark red or black in colour, and more or less porous and dry-looking. This is due to the separation of the muscle fibres by the gas formation. The affected tissues give off a characteristic odour resembling rancid butter. A blood-stained discharge is given off when the muscle fibres are cut, and sometimes there are similar discharges in the pleural and abdominal cavities.

The frequent occurrence of the swelling in the upper portion of a limb has given to the disease the name "Blackleg" or "Black quarter."

Properly reared calves are an asset.

Occasionally, however, no external evidence of swelling is noticed, the lesions in these cases being found elsewhere in the carcass.

Treatment and Prevention

Curative treatment is useless. Any attempt at such, by incision of the affected portion and the application of strong disinfectants, is to be condemned because of the certainty of spreading organisms which are very abundant in the liquid escaping from the cut surfaces.

As the spores of the organism can live in the soil, great care must be taken, as already indicated, to prevent any addition to the number already in the soil. Carcasses should not be skinned or unnecessarily cut up, but should be disposed of by complete burning. Cattle of susceptible age should be kept off known infected pastures and periodical burning of these infected pastures is a further method of prevention.

Vaccination

The only effective method of preventing the disease is by vaccinating calves before they reach the susceptible age, and the Commonwealth Serum Laboratories prepare a vaccine which is recommended for this purpose. It contains no living organisms, therefore it is quite safe, and it confers an immunity which persists during the susceptible period. A permit to obtain the vaccine will be supplied on application to the stock inspector of the district, and the inoculation, which consists of the injection of the vaccine (under the skin) can be carried out by the farmer himself. The usual precaution of clipping the hair and sterilizing the skin with tincture of iodine or methylated spirits before injection should be observed. The inoculation is made usually behind the shoulder. A suitable hypodermic syringe and needle is all that is required, and this with care will last for years, so that the only expense each year is the cost of the vaccine itself.

Blackleg is a notifiable disease under the Stock Diseases Act, and all outbreaks should be reported to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

All sudden deaths amongst young cattle, associated with lameness and the characteristic crackling swelling in the muscles of the limbs should cause stock owners to suspect blackleg. In suspicious cases, in order that the diagnosis may be confirmed a portion of the affected muscle—about 2 inches in diameter—should be placed in a screw-top jar, and this, securely packed, forwarded to the Director, Veterinary Research Institute, Parkville, N.2. A letter advising the despatch of the specimen for diagnosis and describing symptoms noticed, should be forwarded at the same time.

NITROGEN FOR FRUIT AND VEGETABLE PRODUCTION

(Continued from page 338)

in increased yield and better appearance Single applications to vegetable crops should not exceed 2 cwt. per acre and the fertilizer should not be allowed to come into contact with the plants, otherwise injury will occur.

In mixtures with superphosphate, nitrate of soda is less satisfactory than sulphate of ammonia, unless it can be used immediately after mixing, because it has a tendency to absorb moisture from the air and become damp. In storing nitrate of soda for future use, the bags should be stacked in a dry, well-ventilated shed.

Fruit and vegetable growers who in the past have used sulphate of ammonia with profit, should now have no hesitation in using nitrate of soda.

Live Stock Notes

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Cheaper Ground Grain

SINCE the beginning of 1940, there has been insufficient bran and pollard to meet farmers' requirements. This has been due not only to an increased demand, but, for the past eighteen months, to a greatly decreased production.

Because much flour is normally produced and exported from Australia, sufficient bran and pollard has been available in the past. Stock feeders, therefore, have based their rations almost solely on bran and pollard, and have little experience of feeding ground grain to their stock.

In those European countries which imported flour prior to the war and consequently had little bran or pollard available, the basis of rations of hand-fed animals was cheaply imported corn (maize) from the Argentine. The maize was ground and mixed with oil cakes and meat meal to supplement the home-grown fodders for cattle, pigs, and poultry.

Maize is far too expensive for stock feeding in Victoria, but there are other grains, wheat and barley, which have similar food values and feeding properties, and are cheap when purchased in bulk direct from the Boards controlling their sale and distribution.

In small quantities, wheat and barley, and more particularly ground wheat and ground barley, have been expensive and difficult to buy, but these difficulties can be overcome. By a little organization and co-operative effort, an abundance of cheap feed can be made available.

Few farmers have the money to finance truck loads of grain, few have the shed space to store it, or a mill to grind it, and fewer still have all three necessities combined. Wheat costs 3s. 6¾d. per bushel, Williamstown basis, and barley 2s. 6d. per bushel at Wimmera and Mallee sidings in truck lots direct from the respective Boards.

Farmers' Co-operative Companies.

The solution is for farmers' co-operative companies to do the job for their customers. The Co-operative Dairy Factories, Produce Stores and Trading Companies are sufficiently well distributed throughout country districts to service most stock feeders. Where no co-operative companies exist, as amongst poultry farmers in the metropolitan area, there is an opportunity to establish them. In the past, poultry farmers have been dependent yet unco-operative, but now is the time to co-operate and solve one of the industry's greatest problems—the provision of adequate and cheap feed supplies. The same may be said for some farmers supplying milk to Melbourne, but there are no reasons why they could not join forces with the poultrymen in this big problem.

Already a few co-operative dairy companies are installing gristing mills, and supplying ground grain at cost to suppliers, while a few others are buying the grain and having it ground locally, under contract, for their customers. In this way a saving of up to 1s. per bushel to the feeder is being effected. At such prices it pays to buy feed.

The principal reasons for such a big saving are given hereunder:—

1. The wheat or barley is railed direct from the station near where it is grown to the co-operative company in the centre of the district where it is to be fed. As there is no break in the journey, the freight is very low. There is also no possibility of the ground grain being railed back along the route of the whole grain.
2. The grain has not to be untrucked and re-trucked after grinding in Melbourne or other intermediate centre.
3. The company buys in 1,000 bag lots at a concession price over truck lots.
4. The grain is not handled by any intermediate agent or merchant.
5. The grain is delivered at cost to the feeder.

Directors of co-operative companies should encourage the establishment of produce departments, including a grinding mill. A small mill and plant could be erected for £500, and another £500 would be necessary to finance grain purchases. For double this amount of capital a large produce store and plant could be erected.

The staffing of the department should not present a serious problem in dairying districts, because most feed would be required in the winter time, when production is lowest and, by proper organization, the bulk of the work could be done by the farmers, under the supervision of the factory staff.

It is emphasized that the ground grain should be distributed at cost, because, in dairying companies, it would be unethical to use profits made in the produce department to increase the price paid for butter-fat. The good feeder and the farmer with a lot of pigs would be penalized if this were done.

Transport Problems.

The railways have been blamed for much of the chaos in the transport of feeding stuffs and their consequent shortage. Such hasty criticism however is scarcely fair. Ever increasing demands are being placed on the railways, and at times there are not sufficient trucks available for the work offering, and some delays are unavoidable. If all the co-operative companies established produce departments, it would be possible to hold sufficient stocks of ground grain and other feed to carry over the short periods when the railways are overburdened. Stocks could be replenished, as soon as pressure on the railways eased. Furthermore, if feed were consigned direct to its final destination, the trucks would be less time *en route*, there would be less shunting, and no haulage back over the same route. This would assist the railways.

There have been cases where wheat has come through Ararat to Melbourne to be ground, and gone back through Ararat to Hamilton to be fed—250 miles of unnecessary haulage. If such unnecessary haulage were eliminated on feed alone, there would be many rail trucks made available each day for other freight.

Dairy Cows

Although ground wheat may be fed wholly or in part to replace ground barley or pollard on a pound for pound basis in the rations of poultry and pigs, some precautions are necessary when feeding ground wheat to dairy cows, because the ground wheat is apt to run together, and form a doughy glutinous mass. This doughy mass cannot be regurgitated, and may remain in the rumen until it goes bad, causing "food sickness". To prevent this, it is advisable to thoroughly mix the ground wheat with some chaff. This will keep the mixture free and friable. As chaff is scarce and expensive, it may be necessary to use the minimum quantity, which is one pound of chaff to every four pounds of ground wheat. Any type of chaff, including flax boll chaff, may be used for this purpose.

Wheat may not necessarily increase milk and butter production, because it does not contain enough protein. When there is some green pasturage, or where an ample quantity of good lucerne hay or chaff is available, these feeds should provide sufficient protein, although better results will always be obtained by feeding some protein rich meals, such as meat meal or linseed meal with ground wheat.

Where there is no green feed, or good quality lucerne or clover hay or silage, 1 lb. of meat meal or 3 lb. of linseed meal should be mixed with 5 lb. of ground wheat for best results.

For further information on the feeding of different fodders, the reader is referred to the pamphlets "Foods and Feeding" and "Fodders to Replace Bran and Pollard" which may be obtained free on application to the Department of Agriculture, Melbourne, C.2. The methods of buying wheat and barley direct from the Boards were explained in these notes in April last, although since then the Australian Barley Board has increased the price of barley by 2d. per bushel, and has stopped supplying all orders for less than full truck lots.

Sheep

The sheep population of Victoria at the 31st March last was 19,614,040 compared with 20,598,201 at the 1st March, 1942. The statistics show that rams have increased from 251,350 to 254,722, and breeding ewes from 9,620,120 to 9,852,352 during the thirteen months' period. These increases are most satisfactory and indicate that, provided the season improves, there should be no difficulty in maintaining mutton and lamb production during 1943–44.

The decrease in total sheep population has all been at the expense of dry ewes, wethers, and lambs. The statistics also show that the numbers of dry ewes and wethers, 4-years-old and over, are 391,818 and 732,976 respectively and represent a small reserve of aged mutton for canning and dehydration.

Grow Baconers to Heavy Weights

The economy of growing baconer pigs to heavy weights has always been stressed by this Department. The overhead costs of production and treatment become less per lb. as the weight of pigs increases. This usually compensates for the higher food consumption per lb. of live weight gain in heavy pigs. The percentage yield of carcass from live weight increases as baconers increase in weight. Under conditions where a 180-lb. live weight pig yields 69 per cent. of carcass, a 240-lb. live weight pig yields nearer 72 per cent. of carcass. Daily gain in weight increases as pigs approach heavy baconer weights, thus saving time in production of bacon.

What is probably more important at present is that increasing the weight of pigs for slaughter is the quickest and most efficient way of realizing the required increase in the production of pig meats.

Victoria normally has a higher average weight of baconers than other States of the Commonwealth, and so there was some concern when, under the Commonwealth Pig Meat Control Plan, it was first proposed to limit the weight range of top price baconers to 150 lb.

Victorian pig raisers should be gratified that the Pig Plan provides for top prices to be paid for baconers up to 180 lb. chilled carcass weight, and every effort should be made to carry baconer pigs close to that limit.

As the price for pigs over 180 lb. dressed weight drops sharply, care should be taken not to carry pigs on until they are over 180 lb. dressed, and a margin of safety should be allowed.

Farmers with facilities for weighing their pigs should aim at a top weight of 170 lb. dressed, that is about 235 lb. live weight, and those who have not weighing facilities should endeavour to sell at a top estimated weight of 160 lb. dressed, which is about 225 lb. alive.

As the price per lb. dressed weight is the same under the Pig Plan for baconer pigs from 101 to 180 lb. chilled dressed weight, and gambling on market fluctuations is eliminated, it definitely pays, once pigs are in this weight range, to take them up close to the top limit.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry

Experiments conducted at the State Research Farm, Werribee, over the past twenty years, have shown that hens lay well on a large variety of different foodstuffs, rations, and methods of feeding, provided they receive adequate supplies of greenstuff and shell grit.

Ground wheat and mixtures of ground wheat, oats, and barley have been used with advantage to replace pollard in both wet and dry mash mixtures. Hens have laid well on soaked grain and meat meal, and this method of feeding may be adopted where pollard is unavailable, and where ground grain prices are unreasonable.

At Werribee, pullets laid an average of $4\frac{1}{4}$ eggs less per year on soaked grain than those fed the usual mash mixtures, but each bird fed soaked grain ate 9 lb. less food. Therefore, normally, the few eggs lost would be worth less than the saving in feed, and it would be actually more profitable to feed soaked grain. Soaking grain however requires a lot of extra work and skill.

In early tests, hens fed whole grain and free choice protein supplement have laid 7 eggs less and eaten 2 lb. food less, than those fed the usual rations of mash and whole grain.

As mash costs fully 1d. per lb. and grain ¾d. per lb., the grain fed birds would cost 5s. 3d. each to feed, as each bird ate 84 lb. of feed, whereas the mash fed birds cost 6s. 3d. each, as they ate 86½ lb. of feed, half of which was grain.

The extra 7 eggs from the hens fed mash just about paid for the extra feed. It would, therefore, pay to feed simply whole grain and protein supplement if wheat can be purchased for less than 3s. 9d. per bushel, rather than purchase pollard or ground grain for 1s. 8d. per 20 lb. (£8 6s. 8d. per 2,000 lb.) or more.

In a recent test for which final figures are not yet available, hens have laid particularly well on whole grain and free choice meat meal. These hens have laid more eggs and consumed less feed than hens receiving bran and pollard or crushed grain mashes, &c. The full results will be published at a later date.

Incubation.

An important factor for successful incubation is an adequate supply of fresh air. The chick-embryo needs oxygen which is obtained from fresh air. To ensure a regular supply of fresh air in the machine, the incubator room, as well as the machine itself, must be well ventilated. Many instances have been noticed where bad ventilation has been the direct cause of poor hatches due to the chicks dying in the shell. Often in an endeavour to keep the incubator room at an even temperature, the ventilators are closed, but probably the lack of fresh air does more harm than a slight variation in temperature.

Before each hatch, the incubator should be thoroughly scrubbed and cleansed with a good strong disinfectant, such as formalin. It has been definitely proved that pullorum, one of the worst diseases affecting chickens, can be spread by the agency of the incubator, hence the importance of this measure.

The door of the incubator should not be opened after the 18th day until the evening of the 21st day, when the hatch should be completed. The chicks can then be toe-punched and put into the nursery trays or chick boxes to remain there for about twelve hours before being transferred to the brooders. The temperature of the brooder should be about 90 degrees.

Recording and Marking Chickens.

The recording and marking of chickens present an even greater problem than for other stud stock. Each breeding hen may produce several dozen chickens in the season, and marking or branding must be done soon after hatching, before their identity is lost; the chick is then very small and the scope for branding limited.

In the first place, the eggs to be hatched must be marked as they are collected each day. During incubation, it is not necessary to separate the eggs from different matings until the 18th or 19th day. The eggs from each hen or pen of hens are then placed in pedigree trays—small wire boxes—in which the chickens hatch. As they are taken from these trays they are branded, after which they can be mixed with the other chicks.

The branding is done by piercing the small membrane or web between the toes with a punch or with a hot needle; the latter is preferred as the searing prevents bleeding and the hole is less likely to close up.

There are two webs on each foot, and these allow for four single brands, and by marking two or three or four webs, 14 different brands are available. To simplify the recording of the brands, the webs may be lettered from right to left A.B.C. and D.

A brand on the outside web of the right foot would then be recorded as A., and on both webs of the right foot A.B., and on both webs of the right foot and the outside web of the left foot A.B.D. and so on.

For farmers and others who run a small flock of fowls on free range, it is advisable to brand each year's chickens differently, so that their ages will always be known, and old birds disposed of when they become unprofitable.

[W. O. Pederick, Assistant Poultry Expert.]

Bees

To have strong colonies with sufficient worker bees for the honey harvest, good worker combs are essential. A correctly-wired frame and a a perfect sheet of foundation, well milled from pure wax, judiciously manipulated and placed, are necessary to secure a good comb that will maintain its worker brood area over a period of years, and not be forced into disuse by the queen through sagging.

In stressing the importance of perfect worker combs, it is well to bear in mind that, in each square inch of comb, there are cradled about 50 baby worker bees.

This fact gives some idea of losses incurred in worker bees by the use of poor combs.

The best results are obtained in securing perfect combs, by having them drawn out in the supers, on a honey flow that is not too heavy. Combs drawn on an exceedingly heavy flow often sag just below the top bar, on account of the heavy weight of honey they have to maintain while new, especially in hot weather.

Combs should be drawn in the supers, and then placed in the brood nest to receive a few hatchings of brood, which will strengthen them up by the addition of cocoons from the resultant brood.

It is unwise to place foundation on colonies before the flow commences, as the bees often chew round the intersections of the wiring, and spoil the sheet, and the most economical way to draw combs is to place a couple of sheets in the supers of the productive colonies at each round of extraction.

As wax secretion and honey gathering are correlated, comb building cannot be carried out during a dearth of nectar.

Damaged combs can be repaired by cutting out the bad patch and replacing it with a piece of foundation, or drawn worker comb, secured by the use of melted wax or a moderately hot soldering iron.

There are many methods of wiring to support the combs and eliminate sag. The best method is to have the horizontal wires in conjunction with an inverted V wire suspended from a staple driven into the centre of the underside of the top bar, and passed through the end bars one inch from the bottom.

[W. A. Collins, Apiary Inspector.]

VETERINARY NOTES

Forwarding Sheep Specimens for Diagnosis

On properties where fairly sudden deaths occur amongst sheep or lambs, the owner can facilitate the diagnosis of the disease if he forwards specimens from a freshly dead animal for examination. The whole of the internal organs, including the heart and lungs, should be placed in a kerosene or petrol tin and covered with a weak solution of formalin (1 cupful in two gallons of water).

If the bowels are two voluminous to be placed in a tin, the paunch may be discarded. All cut ends should be securely tied to prevent leaking of food material and the consequent staining of the specimen.

The tin should be soldered down, clearly addressed to the Veterinary Research Institute, Parkville, and forwarded by rail to Spencer-street or Flinders-street railway station.

Live animals and lambs should be sent where possible and specimens from lambing ewes should include a fresh blood sample. This should be collected into a sterile 1-oz. bottle and may easily be taken at the time of slaughter if killing of the animal is necessary. Faecal droppings, preferably from individual sheep are very useful to aid in the diagnosis of worm infestation.

In all cases the Director of the Veterinary Research Institute should be advised, by letter, of the despatch of the specimens, and also of any symptoms shown by the animal.

Owners are expected to pay freight on specimens forwarded, but the investigations by the Institute are done free of charge.

Owners are notified of the result and whenever possible, a Veterinary Officer of the Department will visit and discuss treatment and control.

[A. R. Grayson, B.V.Sc., Veterinary Officer.]

Foreign Bodies in the Mouths of Cattle

On examination of cattle reported as suffering from Actinomycosis or Lumpy Jaw it is at times found that the swelling is due to a foreign body. This is usually a piece of bone which the animal has been chewing and which has become wedged between the back teeth and the cheek.

In the case of Actinomycosis or Lumpy Jaw the swelling is due to a thickening of the bones of either the upper or lower jaw. This enlargement is not movable on manipulation.

In the case of a foreign body, though often wedged in rather firmly, examination usually reveals some movement. When this is noticed the mouth should be forced open (preferably with a mouth gag) and the object removed by hand or a pair of long pincers. This should be done as gently as possible to prevent tearing of the membranes of the mouth. The mouth should then be syringed daily for a few days with salt and water; one (1) teaspoonful of salt to a pint of water.

Bone chewing is due to mineral deficiency and to overcome this, a lick compound of salt 70 lb. and bone flour 30 lb. should be made available for the cattle.—[Contributed by the Live Stock Division.]

PASTURE INVESTIGATIONS

Results of 1942 Trials

Extracts from the Eleventh Annual Report of the experimental pasture work conducted by the Department of Agriculture for the Victorian Pasture Improvement League. The first portion of this report, containing a general review of the pasture situation in 1942, was published in this Journal for June, 1943.

The site on which the experimental plots were established on unimproved "salted" land at Mr. A. Kerr's property, Kerang East.

OBSERVATIONS ON SALT RECLAMATION TRIALS

By A. MORGAN, B.Agr.Sc., Irrigation Field Officer

Early in 1939, arrangements were made with four farmers, in the Kerang and Cohuna districts, for the establishment of experimental plots on salt-affected land.

The breaking of the severe drought of 1938, and an exceptionally good autumn rainfall from February, 1939, onwards, prevented the grading of the plots being carried out until the following summer. In the interim, visits were made to a large number of farmers interested in the reclamation of salt-affected lands, and as far as possible their ideas and theories were used as a basis for the experiments. The original plans have since been modified considerably, principally because of the disturbing influence of seepage. This was marked on all the blocks, and all ideas of carrying out differential watering tests were abandoned in the spring of the 1942 irrigation season.

Before this change was necessary, however, sufficient evidence had been obtained to enable recommendations for the treatment of badly "salted" soils to be formulated.

Although very "salty" land can be reclaimed, even where a permanent free-water table exists close to the surface, and where the ground-water is highly charged with harmful mineral salts, it is common sense to make a preliminary examination of the water table before planning the method to be used in reclamation.

For those persons unacquainted with "salty" land it is very difficult, if not impossible, to comprehend the importance of the outstanding feature of all badly-affected land, i.e., the fact that in areas served by drainage systems the surface of the permanent water table, as shown by bores, is usually 3 feet or more above the normal level of the water in drains only half a chain distant. From the normal water level in the drain, to approximately the height at which the free water rises

in bores nearby, the sides of the drains may show a colouration which suggests that there is "weeping" of water through the side of the drain, but no cases have been observed by the officer in charge of the experimental work at Kerang, where the movement of this moisture has actually reached the trickle stage.

Seepage

Opposed to the inactivity of the ground-water at its normal or equilibrium height, there is rapid movement of water as a result of any extra ground-water which may be supplied by irrigation or rainfall—this movement, in whatever direction it occurs, may conveniently be termed "seepage."

An important point is that in most cases seepage is unpredictable in its effects—it is only when an attempt is made to grow a crop or establish a pasture or lucerne that the unwelcome discovery is made that deterioration of the land has occurred. A good example of this was recorded on Mr. A. Kerr's property at Kerang East, where a 10-acre plot was laid down on "red plain" (Macorna clay). In an endeavour to test out as many as possible of the theories current in the district in regard to the best methods of reclaiming "salty" land, short and long-term programmes for the establishment of lucerne and pastures were included in the trials, as indicated below:—

1. Lucerne, permanent pasture, or Wimmera rye grass-subterranean clover sown in the first autumn after grading.
2. As in 1, sown after a crop of barley, oats, or millet.
3. As in 1, sown after two years' cropping.

The net result of this procedure was that while the lucerne and pastures sown in the first season persisted, and, in the case of the lucerne, showed a definite improvement, and while the powdery, salty patches on these bays became covered over with pasture and weeds, the bays left for the establishment of lucerne and pastures after cropping were so badly affected by seepage that sowings made in autumn, 1941, were, for all practical purposes, complete failures.

Exceptions were those bays which had carried crops of millet—in other words, those bays watered regularly throughout the summer and on which the seepage effects from other bays watered during summer had been prevented.

It was impossible to carry out any very accurate investigations of movement of water on these plots, when bore measurements were the only source of information, but on one occasion an experiment was conducted in regard to the movement of water at Mr. Kerr's.

Bores had been put down at intervals of half a chain from a bay of permanent pasture. The head-ditch was blocked at the outlet of this bay, thus eliminating as far as possible any seepage from the ditch.

Frequent readings of the water level in the bores were made from the time irrigation commenced until the irrigation of the bay was completed, and the head-ditch was then emptied quickly into the back-cut of the State Rivers and Water Supply Commission's supply channel.

The effects of seepage resulting from the watering of the pasture bay were evident, from the measurements of the water level in the various bores, for at least 4½ chains before the experiment was terminated.

No attempt was made to determine whether the rise was due to the fresh irrigation water flowing over the surface of the permanent ground-water (although this is merely a simple way of stating the case, because the ground-water does not exist as an actual pool), or was caused by a welling-up of salty water due to the overfilling, by the addition of fresh irrigation water, to the ground-water, of some subterranean zone in which movement of water is relatively free. Such zones, generally called "drifts," occur in the Kerang township area at depths of about 40 feet, and are made use of by the Kerang Sewerage Authority when repairs to sewage mains are being made. A shaft is dug, and then a bore is put down until the "drift" is tapped. The water is under considerable pressure, and shows a head of about 25 feet. By connecting up a direct-drive electric-motor-and-pump combination the ground-water can be lowered over a considerable area.

In view of these facts, and the negligible amount of lateral flow of underground water into the State Rivers and Water Supply Commission main drains which pass through salt-affected lands showing a high permanent water table in bores, it is considered that seepage troubles which are traceable to irrigation are due almost entirely to a welling-up of ground-water highly charged with harmful minerals. In any case, this theory provides a satisfactory explanation of most of the effects of seepage in land adjoining irrigated land.

In the Cohuna district, on two occasions, interesting phenomena were observed, for which no explanation can be offered here. In

one case Mr. H. C. Kermode, then District Engineer for the State Rivers and Water Supply Commission at Cohuna, drew attention to sink holes which had developed in the bed of a deep drain. Water poured down the holes, which were up to 2 feet in diameter, for days. This was remarkable, considering that the land adjacent to the drain was badly affected by alkali, carried very little vegetation other than "bead-bush" (which usually indicates about 1 per cent: of alkali in the surface soil), and had a permanent high water table. Presumably the water was escaping down the sink holes into a "drift" which had escaped saturation previously. That the "drifts" are not efficiently connected together has been shown by observations made by Mr. A. G. McKenzie, Shire Engineer, Kerang.

Perennial rye grass and white clover in the experimental plot on the property of Mr. F. Kane, Kerang.

A second interesting observation was made at Mr. T. Major's, McMillans, where a siphon was constructed. A small spring was tapped, showing that some water near the surface was under pressure.

Precise discussions on permanent ground-water can be found in various bulletins published by the Council for Scientific and Industrial Research. Here, it is proposed to touch only on the observations made on the experimental blocks around Kerang, and to outline what might be termed the habits of the permanent ground-water as far as they affect the growth of crops.

A most important thing to remember is that, in practically every case where highly-mineralized ground-water shows permanently close to the surface in bores, the effect of that water extends much nearer the soil surface than is indicated by the level of the water in bores. On the Cohuna plot (T. E. E. Bond's, McMillans), for instance, the soil above the level of the water in the bores was apparently permanently saturated, and the result was that practically no leaching down of the alkali of the surface soil could be obtained. The ground could be watered, under any variations of the border-check system, with less than 1 inch per acre. As the water progressed down the bay a yellowish froth or scum was noticeable, and was particularly prominent when sufficient water was applied to cause flow through the drainage gaps. Obviously any benefit derived by watering this type of salty land is derived mainly from the washing-off into drains of the alkali accumulated right at the soil surface.

Use of Vegetative Cover

Seeding trials on ground of this type—heavy grey clay in low-lying situations—would not be economical except for the fact that in most cases there are scattered low patches which are likely to have been partially or wholly reclaimed by years of leaching by rain, or by irrigation water which has stood in them until absorbed or evaporated. Such places will grow patches of Wimmera rye grass, strawberry clover, &c., which serve as seed-producing centres from which useful species spread out as reclamation proceeds.

Other important seeding centres are provided by patches of "salt-weeds" such as sea-blite (*Suaeda maritima*). Definitely, it pays to allow rubbish of this type to grow unchecked; it shades the ground, and during its growth it causes small accumulations of dead leaves and stalks, seed-cases, &c.—in these little patches of debris seeds of more useful grazing species lodge, and with favourable shade and moisture conditions they germinate and may grow to maturity. The low-grade barley grass, commonly known as "bastard barley grass" (*Hordeum maritimum*, "Sea Barley"), is particularly valuable as a volunteer species; it provides the first cover of any considerable grazing value on alkali land which is being reclaimed by irrigating without the addition of agricultural seeds. The species is widely distributed throughout the district, and its seeds are everywhere, awaiting favourable conditions for establishment.

Necessity of maintaining a cover of vegetation, whether of grazing value or otherwise, while irrigation proceeds with the objective of leaching the alkali down beyond the root zone or washing it away off the surface into the drains, places definite limitations on the amount of cultivation which can be safely given, and also restricts the period of the year when cultivation should be undertaken. The cheapest seeds are those supplied by nature—invariably those plants of most value for grazing and at the same time most tolerant of salty conditions are in the group classed as winter-growing annuals. The group includes such plants as barley grass, trefoils, annual clovers, subterranean clover, Wimmera rye grass, and barb grass (*Lepturus*). With cool weather and a good rainfall through from autumn to spring the whole outlook on salt-affected land is changed, and production of edible herbage may be considerable. Under droughty conditions the production is greatly reduced.

Another set of plants such as "wild millet" (*Echinochloa crus-galli* Beauv. "Barnyard grass"), couch grass, strawberry clover, &c.—all summer-growing species—can develop to a similar extent and in a similar manner where waterings are given regularly and frequently during the irrigation season, but the labour and expense incurred is higher than in the former case, and where large areas are concerned such treatment is generally impracticable. At Mr. T. E. E. Bond's, and at Mr. D. J. Smith's—both plots on heavy black clay—the more frequently watered bays were outstandingly superior, but it is mainly on the small holdings of the Cohuna district that any consistent summer watering of salty land is practised.

Management of Watering

Even on the Cohuna farms, the frequent and regular watering of salty lands, considering the poor production of fodder obtained from them in the first year or two, is uneconomic unless the land is prepared in a manner suitable for efficient watering. Grading is therefore the first requirement for success. Although bore readings on all the plots over a period of years have not demonstrated that grading has any appreciable effect in lowering the level of the permanent water in the bores, grading does reduce the time, labour, and water cost involved in reclamation; further, when the land has been reclaimed no further drastic interference by deep ploughing, &c., is necessary, and the possibility of the land reverting towards its original salty condition is reduced to a minimum.

Realizing that the rate of leaching-out or washing-off of the harmful mineral salts in the surface soil is directly related to the amount of irrigation water which is absorbed during a watering, and endeavouring to counteract the very poor absorption shown by land of the type used at Mr. T. E. E. Bond's, Cohuna farmers in some cases have resorted to ponding water on such land. That reclamation can be speeded up in this way has been shown by tests at Mr. D. J. Smith's. The differential watering tests on a section laid out on the border system were duplicated in a series of ponding trials. Ponded areas received an average of 5 inches of water at each irrigation, compared with the 3-in. watering given on the bays in the border system section. By the end of the first watering season the ponded areas were outstandingly superior to the others. Where the 5-in. watering was given fortnightly the areas were completely reclaimed, covered with Wimmera rye grass and barley grass, and in sufficiently good heart to allow subterranean clover (Mt. Barker) to be established on them the following autumn by surface sowing (mixed with the manure at top-dressing).

The fact that the ponding system gave such good results, however, was due to the grading as much as to the extra water supplied, and it is not intended that persons wishing to excuse bad watering methods should be able to point to these results as a justification for their inefficient practices.

The plots have shown, without any necessity for delicate experiments, that reclamation is related directly to the amount of water absorbed. The ponding method has disadvantages, however, because seepage effects on adjoining unirrigated or seldom-irrigated land are increased. Welling-up of salty water under land adjacent to a ponded area is more pronounced, particularly if the ponded area has not been graded, and the effect is likely to extend for a greater distance outward than in the case of land watered under the border system. The nearer the salty water rises to the surface by this seepage, the greater the likelihood of an increase in the amount of harmful mineral salts left behind near the surface when the water is evaporated. It has been contended that if a cover, even of dry herbage, is maintained on unwatered areas adjoining irrigated land, seepage effects will be negligible. This is probably correct in areas where the groundwater in bores is in equilibrium at about 4 feet below ground surface, but the evidence of the

Kerang plots is that under the conditions specified the harmful effects of seepage are noticeable where the water in the bores reaches equilibrium nearer to the surface.

To quote a particular case—at Mr. A. C. Kerr's, Kerang East—a bay of Wimmera rye grass and subterranean clover was established in the autumn of 1940. The adjoining bay was not graded or sown, and was used for manurial trials on the original vegetation under summer watering conditions. Through the summer, in accordance with normal practice, the Wimmera rye grass-subterranean clover bay was kept dry, and when watering was recommenced next autumn it was found that it had deteriorated. On this block, equilibrium of the water in bores is reached at about 30 inches below the surface.

The question of manuring is bound to be brought forward in any discussion on the reclamation of alkali lands. On lands in their normal state, under irrigation, there is no doubt whatever that the carrying capacity of any property can be greatly increased by consistent and liberal applications of superphosphate. With salt-affected lands, if a programme of top-dressing is contemplated, the operator may have to regard his investment as a long-term one. While the salt concentration in the surface soil is still high enough to inhibit the growth of barley grass, &c., there can be little hope of extra production resulting from top-dressing, no matter how heavy. It is the correct use of water, at that stage, which is the key to progress.

Suggested Procedure for Reclamation

The operations necessary for reclamation of badly-affected land might therefore be listed in the following order:—First, the land should be properly graded to eliminate waste of irrigation water and to give all the soil the same treatment. Second, the irrigation water used should be applied systematically—either as autumn-spring waterings for the encouragement of winter annuals, or as regular frequent waterings right through the watering season to encourage a type of summer pasture in which either couch grass or umbrella grass ("windmill grass," *Chloris truncata*) will be conspicuous. Sporadic and irregular waterings with no planning will in all probability do more harm than good. Third, top-dressing should be commenced when the barley grass cover becomes reasonably uniform, and can be accompanied by surface sowing of subterranean clover, Wimmera rye grass, &c. However, there are no fixed rules at this stage, since there are no difficulties attached to establishing crops and/or pastures once the dried surface soil shows hard and cracked, instead of the soft dusty surface produced by alkali. At this stage it will be found that the ground-water, although its equilibrium level in bores is not affected noticeably, will be reduced in mineral salts content.

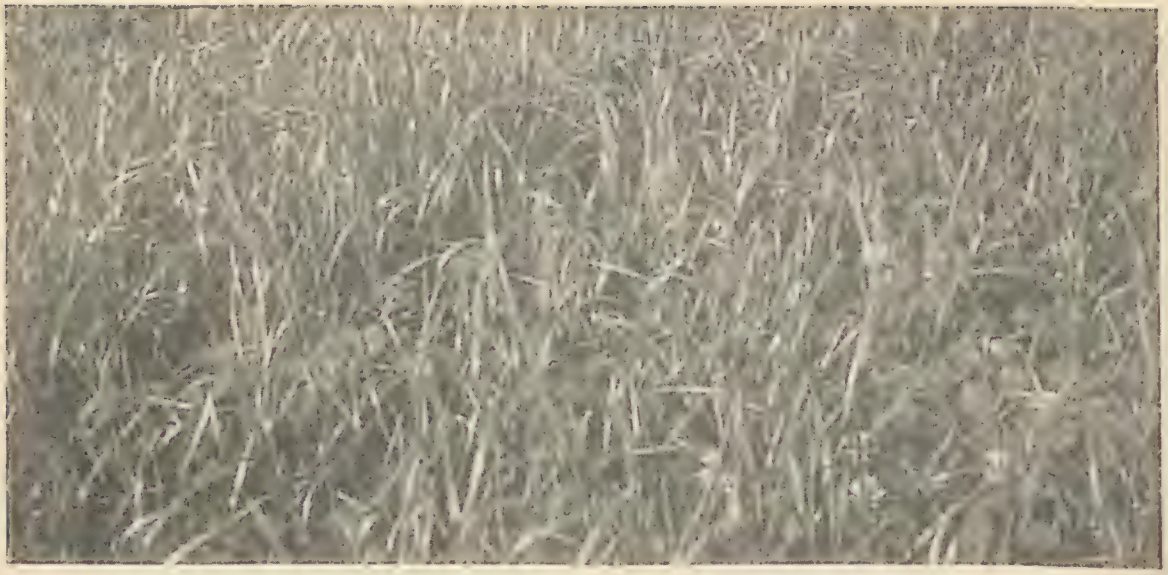
OBSERVATIONS ON NORTHERN IRRIGATION PLOTS

By G. B. RAYNER, B.Agr.Sc., Assistant Agrostologist

Although the measurement of yields by means of mowing and weighing clippings has been discontinued and the experimental areas turned over to grazing, differential manuring has been maintained, and all plots have been top-dressed as formerly.

At the present time the experimental plots may be looked to for an indication of the effect which rationing of superphosphate is likely to have on pasture production.

All except one of the country plots were laid down and differentially manured for some years prior to any measurement of yield. At Stanhope, however, an area of pasture which had received an annual uniform application of 2 cwt. of superphosphate per acre for eight years was fenced off in 1938 for a mowing trial. Strips of the pasture were top-dressed with superphosphate at various rates per acre, and mowing was then undertaken. This provided yield figures to show the effect of the reduction of superphosphate on a pasture which has been regularly manured for some years at 2 cwt. per acre. That is to say, the annual rate of top-dressing was maintained on the "Superphosphate 2-cwt." plots, was reduced by 50 per cent. on the "Superphosphate 1-cwt." plots, and was withheld on the "No-manure" plots.



A luxuriant mixed pasture containing Italian rye grass under irrigation at Tongala.

The yields from these three treatments for the three and a half years of mowing are shown in Table 1.

PLOTS ON PROPERTY OF E. HADFIELD, STANHOPE.

Table 1.

Manurial Treatment.	Yield in Cwt. Greenstuff per Acre.			
	1938-39.	1939-40.	1940-41.	1941-42. (Six months)
Super., 2 cwt. per acre	280	342	328	234
Super., 1 cwt. per acre	301	340	263	205
No manure ..	298	309	274	175

The extent of the reduction in yield can be expressed as a percentage of the yield of the "Superphosphate 2-cwt." plots. A statistical analysis of the figures from the whole test has shown that no significance can be attached to differences of less than 10 per cent., accordingly differences of this order only are shown in Table 2.

It will be seen that total cessation of top-dressing did not have any effect for the first year, but after that it resulted in an increasing reduction in yield. It has also been associated with a progressive deterioration of the sward, which it is anticipated will become more marked as time goes on. The reduction of top-dressing to 50 per cent. of normal did not have any effect for two years, after which there was a sharp decline in yield. This was expressed botanically by a decrease in white clover, resulting in the dominance of subterranean clover. It would appear from these figures that the reserves of phosphate built up by regular manuring at the rate of 2 cwt. of superphosphate per acre will be sufficient to maintain an irrigated pasture for about one year after top-dressing ceases, and if the annual dressing is reduced to 1 cwt. per acre, the residual value of previous manuring can be expected to last for about two years. After this, there will be a grave reduction of the valuable elements in the pasture, with an attendant reduction in yield.

Table 2.

Reduction in Annual Dressing of Superphosphate.	Significant Reduction in Yield.			
	1938-39.	1939-40.	1940-41.	1941-42. (Six months)
	%	%	%	%
50 per cent. reduction (Super., 1 cwt. p.a.)	Nil	Nil	19·8	12·4
100 per cent reduction (No manure)	Nil	9·7	16·5	25·2

The effect of a top-dressing programme on the yield of a pasture is not the only criterion of merit, for it has been found that various manurial treatments will induce changes in the botanical composition of a pasture, and present circumstances permit these changes to be observed with the assurance that they are not masked by any influence which regular mowing may have exerted on the sward. Not only has it been noticeable that the plots which have

received no manure have become increasingly weedy compared with the top-dressed strips, but it has also been observed that the quantity of fertilizer applied is an important factor in determining the relative survival of the valuable species. This is typified at Stanhope, where subterranean clover is the dominant legume on the lightly-manured plots, whereas white clover predominates on the plots which have received dressings of superphosphate.

Summary

The following have been formulated largely from results obtained from V.P.I.L. plots, and are submitted for general guidance on the subject of pasture improvement.

(1) The key to pasture improvement in Victoria is the improvement of soil fertility, and in practically all cases this can be achieved by top-dressing with superphosphate only. In ordinary times, use up to 6 cwt. per acre under irrigation, at least 2 cwt. per acre where the rainfall is 25 inches or more, and correspondingly lesser amounts for lower rainfall conditions. At present, the best use can be made of the limited supply of superphosphate by spreading it over a large area at a reduced rate, rather than on a smaller area at a heavier rate.

(2) In a few areas an application of lime is necessary before top-dressing with superphosphate can be fully effective. In such places the use of a dressing of 8 cwt. of carbonate of lime or 4 cwt. of burnt lime every five years is recommended. Areas where lime is known to give a marked response are on the red soils of Gippsland, the silurian and basaltic soils at Kilmore, and the silurian at Coldstream. At all other places one should be guided by the results from a trial strip across a superphosphated paddock before incurring any large expenditure on lime. If the soil is responsive to lime, all forms of lime will give a positive result. Under no circumstances should lime be regarded as a substitute for superphosphate.

(3) Deficiencies of soil potash indicating a depletion of soil fertility have developed in certain areas as a result of mismanagement. Farmers are warned not to subject land repeatedly to an exhaustive treatment. Where possible animal excreta, both solid and liquid, should be returned by top-dressing.

(4) Species better than native grasses are available, and when buying seed, certified seed should be purchased in preference to any other. Except in exceptional cases, it is not necessary to sow more than 5 lb. of seed per acre of any pasture plant, and usually two grasses and two clovers are sufficient to produce a satisfactory pasture mixture. Money saved on seed could be well spent on fertilizer. Where the rainfall exceeds 25 inches per annum perennial rye grass, subterranean clover, white clover, and cocksfoot or paspalum are recommended for general sowing. For lower-rainfall conditions, better results can be obtained from subterranean clover with Wimmera rye grass or Phalaris tuberosa.

(5) The ratio of grass to clover in pastures generally can be regulated by control of grazing. Heavy grazing encourages the development of clover and lenient grazing grass.

(6) Surplus spring growth should be conserved for the lean periods either as hay or silage, and is best fed back on to the area from which it was collected.

(7) Pulverizing and spreading animal droppings in the autumn by, for example, using harrows upside down, is beneficial in distributing undigested pasture seeds, reducing the development of rank patches, and improving the strike of seed lying on the ground. On dairy farms an occasional harrowing in addition throughout the year to spread the dung is desirable.

(8) On irrigated pastures liberal top-dressing and frequent and regular watering during the summer are essential to develop a superior type of pasture. If only limited irrigation is available, a simple mixture of subterranean clover, Wimmera rye grass and paspalum would be the best type of pasture to develop, otherwise perennial rye grass, cocksfoot, white and subterranean clovers should be the main species sown.

List of (51) Experimental Plots conducted by the Department of Agriculture for the Victorian Pasture Improvement League

A. Non-irrigated Pastures—

Major Plots (including mowing* and grazing manurial sections and species trials)—

Larpent, Glenormiston North, Cudgee, Cobrico, Caldermeade, Korumburra, Warragul.

Auxiliary Mowing Trials* (potash and lime investigations)—

Colac West, Larpent Park, Cobden North, Cobden East, Cobden West, Warragul North, Warragul South, Lardner, Limonite, Mirboo North, Mardan.

The map shows the location of the various pasture experimental plots conducted by the Department of Agriculture for the Victorian Pasture Improvement League. The type of experimental work carried out on each plot is set out in the accompanying list.

Pasture Establishment Trials—
Trawalla and Hamilton.

Experimental Plots (including mowing* and grazing manurial section and species trials)—
Benalla, Wangaratta, Kergunyah.

Experimental Plot (including mowing* and grazing manurial section)—
Coldstream.

Experimental Plot (mowing* manurial trial)—
Yering.

Grazing Manurial Trials—
Ellinbank and Pirron Yallock.

Experimental Plot (mowing manurial trial—Serpentine superphosphate)—
Ellinbank.

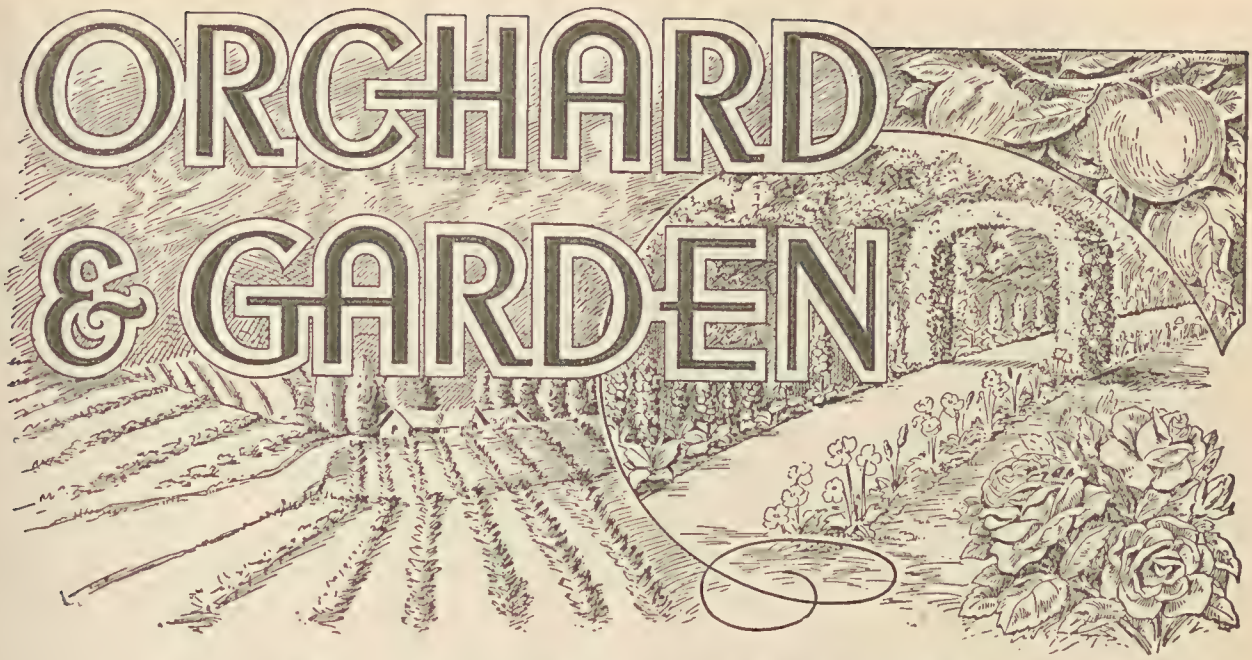
Manurial Pilot Plots—
Callignee, Leongatha, Foster Longwarry, Traralgon, Birregurra, Buckley, Deans Marsh, Bochara, Mortlake, Noorat, Penshurst, Port Fairy, Garvoc, Timboon.

B. Irrigated Pastures—

Experimental Plots (mowing* manurial trials)—
Tongala, Stanhope, Swan Hill, Cohuna.

Experimental Plots (salt reclamation)—
Kerang East, Koroop, McMillans, Tragowel.

**N.B.*—Mowing discontinued, and trials thrown open to grazing in 1942.



IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

ALTHOUGH July may be regarded as the middle of winter, some plants continue to grow and even to flower this month. Deciduous trees and shrubs like the Almond and Flowering Quince (Cydonia japonica) which have a very short resting period, will now be in bloom and other plants may show signs of early growth.

Shrubs

A small shrub which is a very suitable subject in the suburban garden is *Berberis Darwinii*. The foliage is small and of a glossy, dark-green colour and in early spring the bush becomes covered with pendulous clusters of small, orange flowers. It seldom grows more than five feet high and appears to do quite well in a cool position with a moderate amount of sunshine.

Another Berberis which has become very popular as a low shrub in the garden and also as a low, unclipped hedge plant is *Berberis Thunbergii atropurpurea*. This is a deciduous shrub which does best in a sunny location. It seldom exceeds four feet in height and in spring the young foliage is a deep reddish-purple. This colouring continues throughout the summer until late autumn and early winter, when it turns a rich crimson with splashes of reddish-orange colourings.

For those gardeners who seek fragrance in their gardens, *Bouvardia Humboldtii* is suggested. This plant grows about five feet high and produces drooping clusters of long, pure white, tubular sweetly-scented flowers in summer and autumn. To obtain the best results, plant in a sheltered position with either a south-easterly or southerly aspect. A rich soil is necessary for good growth and flowering.

For a hot, open and sometimes dry position, the native *Callistemon* or Bottle Brush is a very good subject. *Callistemon coccineus* bears rich, dazzling scarlet flowers and attains a height of 6 or 7 feet. It is an evergreen shrub with a weeping habit of growth. Other species are *C. lanceolatus*, which has crimson flowers and *C. speciosus* which has large, rich red flowers.

The large, tulip-like flowers of some of the Magnolias are very conspicuous, and much admired in the early spring. Cool, moist situations are suitable for these plants. *Magnolia obovata purpurea* grows to a height of 6 or 7 feet and produces rich, purple flowers with white on the inside. *M. Soulangeana* grows about 12 feet high and is covered with pinkish and purple flowers.

Luculia gratissima, a native of the Himalaya mountains, is a winter-flowering shrub which may grow to a height of 12 or 15 feet, but

which very often in our climate grows only 6 or 8 feet tall. It is an evergreen and requires to be planted with an easterly aspect and where it will be sheltered from frost. The bright pink clusters of sweetly fragrant flowers produced in winter make this shrub a very valuable asset in any garden.

Camellias require a cool position and moist acid soils containing plenty of leaf-mould if best results are to be obtained. Pink, red, and white varieties in both single and double-flowered forms are available. One of the outstanding varieties is *The Czar*, which has large, single carmine-rose flowers with a prominent cluster of golden stamens in the centre. *Spencer's Pink* carries masses of single flowers of a delicate pink shade with golden stamens. *Grandiflora* is known as "White Czar," while *Lady St. Clare* is rather larger and a softer white. The winter-flowering types of *Camellia sasanqua* bear smaller flowers—*Apple Blossom* and *Deep Pink* are two very good varieties of this type.

THE VEGETABLE GARDEN

Onions

The onion requires a cool, moist climate for good growth followed by drier and warmer conditions, and longer days, to successfully form and ripen the bulbs. For these reasons, seed is usually sown in autumn and early winter, and the young seedlings are transplanted in early winter to mid-winter, according to the variety and the purpose for which the onions are grown. The soil should be friable, but should have good moisture retaining properties. The best way to ensure that sufficient moisture will be held in the surface soil is to add well-rotted manure or compost to the preceding crop. By the time the onions are ready to be planted, this material will have become thoroughly mixed with the surface soil and the beds will be in a good state to receive the seedlings. Before transplanting, some form of artificial fertilizer such as 3 parts of sulphate of ammonia and 8 parts of superphosphate should be applied at the rate of 3 or 4 oz. per square yard. This should be mixed with the surface soil by forking the beds. Choose beds known to be fairly free of weeds because constant weeding disturbs the shallow root-system of the young onion plants. For the same reason, remove all weeds while they are still very small and all cultivation should be of a shallow nature.

The best varieties of onion to plant at this time of the year are *Odourless*, *Brown Globe*, *and Brown Spanish*. Space the rows 10 inches apart and allow 3 to 4 inches between the plants in the rows. When transplanting, the young plants should be "topped and tailed". The top third of the leaves is removed and all but about three-quarters of an inch of the root-system. When transplanting do not place the base of the leaves too deeply in the soil. From half to one inch deep is usually sufficient to hold the plants upright.

Potatoes

Prepare the land now for planting potatoes next month. All that is necessary is to dig the beds over roughly. Do not lime the beds in which potatoes are to be planted as this increases the scabbiness of the skins. Obtain seed potatoes now and place them in shallow trays or on bags in a light warm place so that sprouting of the eyes will commence. By exposing them to the light, the new sprouts will be green and strong. The seed can be planted from mid-August onwards. Large seed (tubers) should be cut so that each piece contains two or more eyes and is about 2½ to 3 oz. in weight. It is usual to cut medium sized seed in halves longitudinally, and larger seed may be cut in three or four pieces, depending upon the size. This cutting need not be done until a day or two before planting. Good varieties for early planting are *Carman No.* 1, *Earliest of All* and *Katahdin*.

Parsley

Seed may be sown this month in a shallow drill preferably along the edge of the path close to the kitchen door. Two good varieties are *Triple Curled* and *Paramount*. Cover the seed with about half an inch of fine sandy loam.

Lettuce

To be successful with early lettuce, plant seedlings in raised beds in a sunny position in the garden. Prepare the beds by digging in old fowl manure or well-decayed stable manure or compost, and work the soil into a fine tilth. Suitable varieties for planting now are *Imperial* 615, and *Mignonette* (either the Brown or Green form). Space the rows about 15 in. apart and 12 in. between the plants in the rows. When the plants have become established, say in 3 or 4 weeks' time, water them with a solution of nitrate of soda in water. The strength should not exceed one ounce to the gallon. Three waterings at fortnightly intervals will stimulate growth.

IN THE ORCHARD

Contributed by the Horticultural Division

Almond Growing

ALMOND trees are a useful source of income on many properties in the north of the State. Although rarely planted on a large scale, they are frequently grown for windbreaks around citrus groves and vineyards. Provided the soils in which the trees are grown are well drained and adequate irrigation water is made available during the summer, satisfactory yields should be obtained.

Hatch's Nonpareil is one of the best varieties. The tree is vigorous with a tendency to spread. The nut has a soft shell and the kernel is of excellent flavour.

I.X.L.—Is a popular variety with a tendency to erect growth. It is a good cropper in warm inland areas. The nut is a firm paper shell.

Chellaston.—This variety produces nuts with firm shells and the kernels are of excellent quality. The tree is moderately erect in growth.

Riverside Peerless has a tendency towards willowy pendulous growth. The variety is consistent in bearing. The nut has a soft shell with a kernel of fair flavour.

Johnson's Prolific trees are fairly upright and vigorous in growth. The nut has a soft shell.

Ne Plus Ultra is a vigorous medium-spreading variety. There is a tendency to produce "gummy" kernels in some seasons and it is not as regular in bearing as some other varieties.

White Nonpareil.—A moderately vigorous, spreading variety with a soft shell.

Brandes Jordan.—A strong, vigorous tree of upright growth and therefore favoured as a windbreak. It tends to be irregular in bearing, however, and extensive planting is not recommended.

Pollination.

It is necessary for at least two varieties of almonds blossoming at the same time to be planted together for cross pollination. The following varieties are grouped according to suitability for this purpose. For *Hatch's Nonpareil*, Ne Plus Ultra, Johnson's Prolific, and White Nonpareil may be used. *I.X.L* can be cross pollinated with Riverside Peerless, Johnson's Prolific, and White Nonpareil. Suitable pollenizers for *Chellaston* are Brandes Jordan, Early Papershell, and Riverside Peerless.

Pruning.

Once almonds are planted there is a tendency among many orchardists to neglect them with the result that much weakly growth is developed and the cropping becomes irregular and scanty. Trees will pay handsomely for some attention to pruning. Young trees should be shaped in the orthodox manner so that provision is made for the development of main leaders. After the framework has been established, pruning should not be severe because almonds are vigorous in growth and excessive pruning will produce shoot growth instead of nuts. It may be necessary to remove sub-leaders or laterals near the top of mature trees to prevent overcrowding.

Spraying.

Almonds should be sprayed with Bordeaux mixture 6 : 4 : 40 when buds are showing green tips. This is for the control of "shot hole," a fungus causing holes in the leaves and gumming of the developing nuts. Red spider is also a problem on some properties and summer sprays of white oil strength one in sixty, together with one pint of nicotine sulphate are necessary for the control of this pest. Because of the present shortage of nicotine sulphate, some difficulty may be experienced in control measures.

— — DON'T PASS ON RUMOURS — —

WASHING OF EGGS

Committee's Adverse Report

The following article on the adverse effect of washing on the keeping quality of eggs was extracted from a report prepared by officers of the Council for Scientific and Industrial Research after investigations extending over a period of five years. The investigation programme was arranged in 1938 between representatives of the C.S.I.R., the Department of Commerce, and the Egg Producers Council. Officers of the Live Stock Division of the Department of Agriculture and many Victorian Poultry-farmers co-operated in the work of the Council.

OVER a period of five years, experiments and research work have been carried out by the Council for Scientific and Industrial Research to determine the causes of deterioration in egg quality, particularly in regard to wastage in eggs after being held in cold storage for any appreciable length of time, as, for example, between the time of packing the eggs for export and their ultimate distribution in the United Kingdom, which involved cold storage prior to shipment, and again on the vessel during the voyage.

This investigation programme was arranged and agreed to after discussion in 1938 between representatives of the Council for Scientific and Industrial Research, the Department of Commerce, and the Egg Producers' Council, and the main reason for the decision was that reports from the United Kingdom on Australian eggs there had disclosed portions of consignments which at times were very "patchy," and showed some deterioration compared with the immediately preceding years. While the great bulk of Australian shipments were of excellent quality, there were exceptions, and occasionally serious exceptions, and instances occurred of surprisingly poor outturn of portions of consignments from Australian packers who enjoyed a reputation for careful selection and packing and who were constantly endeavouring to safeguard their own reputations and future business in the United Kingdom. This development coincided closely with the introduction of the egg-washing machine as a labour-saving device on poultry farms, and as there was ample evidence that this quality trouble still arose in instances when the cause could not be ascribed to careless selection or packing, suspicion fell upon the use—or misuse—of washing machines. This was further strengthened by London reports

that some continental countries had already ascribed quality troubles to the use of egg-washing machines.

The need for research on this important matter has been proved again since the cessation, due to war conditions, of shipments of shell eggs overseas, for an increasing percentage of wastage has been in evidence in recent years in respect of eggs stored in Australia for winter needs, and also respecting eggs stored awaiting drying into powder. These results, in the face of improved methods of handling in recent years and generally more scientific and accurate control of cold store conditions, fully confirm that an *adverse factor has crept in, which must be identified and dealt with if we are to eliminate the serious losses being incurred.*

It may seem surprising to some that a period of five years was necessary for the research work, and further, that during the progress of the work little information was forthcoming which might help to overcome the difficulty, even though research work was incomplete. However, this time was actually necessary for a number of reasons which will be briefly explained, and it would have been premature to attempt to give progressive advice before results were proved. It is not proposed to furnish a mass of technical detail herein, but rather to set out as clearly and simply as possible, a preliminary general explanation, and then the conclusions which have been reached and recommendations which can be made therefrom to overcome the difficulty. It will be sufficient to explain, therefore, that in carrying out scientific experiments to determine the cause or causes of loss, it is necessary to confirm all results by repetition of the experiments. An experiment may show that a loss incurs after certain treatment, let us say, by washing on a machine. This is not sufficient in itself, for it has been shown that a similar experiment under apparently the same conditions does not always produce the same or even similar result. The process must therefore be narrowed down until we find one or more factors which are common to all experiments producing an adverse result in egg quality. Some idea of the magnitude of this task may be gleaned from considering the following factors on the farm, any of which is capable of contributing to the final unsatisfactory or bad quality of the egg after storage:—

The type of ration fed to the fowls.
The frequency of picking up eggs.
Method of "hand cleaning" eggs.
If a washing machine is used on the farm, what type of machine
Whether the washing machine is kept thoroughly clean.
Usual temperature of the water used to wash eggs.
Whether the eggs are washed immediately upon being picked up, or several hours or more later.
Whether eggs are immediately dried after washing, or allowed to dry slowly.
General standard of hygiene on the farm.
Whether the eggs are fertile or infertile.
Whether soiled eggs only are cleaned, or the whole pick-up, dirty or not, passed through the cleaning process.

It will be appreciated that in an average day's receivals on any packing floor, eggs received from various sources will fall into almost every possible combination under the above headings, and some from each consignment will candle out as first quality when received, and duly be packed for storage. When some eggs are found to be broken down in quality after storage, the answer to any one of the above questions may be the key to the cause; but it is not possible to know the complete history of every egg. Conditions set out above do not cover all the factors on the farm which may affect the keeping quality of the egg, but they are a good cross section.

It will be seen from this that a process of elimination must take place in experiments to determine which one or more of the suspected factors is mainly responsible for the trouble. To do this, the full history of the eggs used in experiments must be known. This is done by using eggs on a farm, where, with the co-operation of the farmer, the full history of the eggs since laying is obtained and recorded. It is well to record here, that the Council for Scientific and Industrial Research, and in fact, the industry itself, is very much indebted to a number of poultry farmers in every State for their co-operation, without which experiments would have been most difficult.

Sometimes a set of conditions is created to assist an experiment, as for example, the "cleaning" of eggs in water which has been infected with rot-producing bacteria, to ascertain the effect under different conditions of storage, &c.

A clear understanding of one or two fundamental points will be most helpful in appreciating the conclusions and recommendations later in this report.

One is that the rotting of eggs is caused in every instance by bacteria. There are several types of bacteria which produce rotting, which may be what is usually termed "green whites," "red rots," "black rots," &c., and there are also many harmless types of bacteria which do not cause rotting. Every egg has several types of bacteria on the shell, but the damage is done when the harmful organisms penetrate to the inside and by reason of favourable conditions. grow and multiply there, and thus produce "rots."

It is important to note that in these experiments it has been necessary to reproduce the conditions under which rotting has taken place in commercially stored eggs, and therefore it has been necessary to cold store eggs for eight to nine weeks, after various treatments, before making the detailed examinations.

The experiments have been conducted in all mainland States, thus spreading the work and enabling several types of experiments to be carried out simultaneously without overloading the personnel available at any one point. This has also enabled results from one particular type of experiment to be checked up by repeating it in another State, where some conditions may be different.

As a final comment before passing to the conclusions reached and the recommendations made, it is pointed out that experiments must commence under known conditions at the source. If eggs received at packing floors are already bacterially affected, it is impossible to stop the process of deterioration, although the eggs may appear sound and pass the candling test. The experiments were all designed to locate the original source of bacterial infection, which is the only point at which any marked improvement can be affected. The egg is provided by nature with a natural resistance to infection from the outside, but once this has been broken down and bacteria have penetrated the shell, the damage is done and cannot be retracted. The consuming public, whether in Australia or overseas, naturally prefers clean and attractive-looking eggs, and is willing to pay for them, and export regulations require eggs to be clean shelled. These factors encouraged the introduction and wide use of various types of cleaning machines on farms, especially as the percentage of eggs sufficiently clean when picked up to pass the export test is surprisingly small, and some cleaning is necessary to enable the spring surplus to be made acceptable for export.

These cleaning machines themselves require regular attention to maintain them in a reasonable state of cleanliness. When eggs were cleaned on machines which obviously had been neglected, the wastage in stored eggs was always increased. On the other hand, when machines which appeared clean were used, the results were not always dependable. It was found that the reason for this was that even though machines appeared clean they often harboured large numbers of rot-producing bacteria. One such machine in a good clean condition gave over 80 per cent. rots in eggs cleaned on the machine. Other machines which were clean did not increase wastage. However, in the absence of special bacteriological examinations, it is not possible to distinguish the one machine from the other.

We now pass to the conclusions reached, all of which are commended to the most careful attention of producers. It is worth while again reminding readers that these conclusions were reached only after five years' work, and careful checking of initial results until they could be stated as scientifically proved beyond all reasonable doubt. Several dozen large experiments were completed and several thousands of dozens of eggs have been examined individually. In recording these conclusions, the actual text of the final report is adhered to as closely as possible. Any departures from the text are only for the purpose of eliminating technical terms and expressions, and making clear the meaning of the more technical report.

What the Experiments have Revealed

The following conclusions are taken from the final report:—

Work in previous years had clearly incriminated certain cleaning machines as one of the major factors determining wastage in stored eggs. This year, attempts were made to discover the means by which infection is introduced, and to devise suitable measures to control wastage resulting from machine cleaning.

Consideration of the results of the experiments conducted this year, together with those obtained in previous years, enables the following general conclusions to be made:—

1. Cleaning machines, as they are normally found on farms, are the important source of the rot-producing bacteria which cause wastage. While these bacteria may originate on the shells of dirty eggs, they frequently find favourable conditions for multiplication on cleaning

machines. Subsequently, during cleaning they may be transferred back to other eggs in a manner which causes the internal infection of those eggs.

2. During the machine cleaning the bacteria penetrate into or through the shells to situations where they are protected substantially from external influences. This was shown very convincingly by experiments in which disinfectant dips *after* machine cleaning did not materially reduce the rate of rotting in the machine-cleaned eggs. The conclusion was also supported by other experiments in which cleaning methods which caused little or no wastage by themselves were unable to reduce the wastage caused by a previous cleaning treatment.

3. Provided that an abundance of rot-producing bacteria is present, both types of machines tested will increase wastage in eggs cleaned on these machines.

4. All the evidence of experiments is in agreement that cleaning machines have a harmful effect upon keeping quality of eggs, simply because the machines are reservoirs of infection, but the possibility cannot be excluded that one type of machine may have a greater capacity for transferring the harmful effect to the eggs than the other.

5. Experiments have proved that it is difficult, even with the greatest care to maintain a washing machine in a state of *bacterial* cleanliness, and they have also proved that it is impossible to judge with the eye whether a machine is relatively free from bacteria. A machine may appear to be scrupulously clean, yet be seriously infected with harmful bacteria.

6. The use of certain disinfectants in suitable concentrations has resulted in the reduction of wastage caused by cleaning machines. The minimum concentrations which, when applied regularly, will be required to control wastage effectively are not yet known precisely. Experiments have shown that there is some promise of improvement by using disinfectants in cleaning the machines themselves, and in the water used for cleaning the eggs, but too much reliance should not be placed on this as a general "cure," because the rigorous and careful use of approved disinfectants in the proper proportions would entail time and care which would mean much to producers, in return for which they would gain little personal advantage in terms of the value of their eggs, determined by candling on delivery of eggs to a packing floor. The proper application of disinfectants would not be capable of satisfactory supervision and half measures would only mean time wasted without results being obtained.

It is also to be noted that certain disinfectants useful in controlling wastage would be injurious to the fabric of the machine, which would require much more frequent renewal.

7. When clean and soiled eggs are washed by the same machine, wastage or rotting occurs equally, whether the eggs were clean or not when passed over the machine. *Thus it is clearly shown that considerable damage may be done by passing eggs which are already clean over cleaning machines.*

8. Experiments have shown that wastage is very low *when the eggs have not been cleaned, whether they are soiled or not.*

9. Several methods of *hand* cleaning eggs may be relied on to cause only comparatively slight wastage compared with uncleaned eggs. These include wiping with a clean wet cloth, and the "Evans" bucket method. A warning is added, however, that systems are liable to abuse—as, for example, the continued use of a cloth after it has become dirty, neglect to have frequent changes of clean water, &c. In all the methods used the soaking of eggs for long periods has been avoided.

10. If eggs are cleaned in water which is *colder* than the eggs themselves, favourable conditions are set up for bacteria to penetrate the shells, and rotting is induced. In this connexion it should be carefully noted that, as eggs are warm when laid, and take some time to cool down to atmospheric temperature, *it follows that they should not be washed until several hours after gathering.* It is all the more important to emphasize this because it is widely recognized that it is easier to remove dirt while the eggs are still warm.

11. It is important to keep eggs as cool as possible in the time between cleaning and sending to market, as this may have considerable influence on the wastage which any cleaning method may cause.

12. Experiments showed that various diets fed to the fowls did not produce any appreciable change in the keeping quality of the eggs, although, of course, diet does affect the quantity or number of eggs produced.

It will be agreed that the twelve general conclusions just described are most important, and demonstrate quite clearly that the cleaning of eggs by washing machines is generally harmful to their keeping quality. Undoubtedly

the use—even more so the abuse—of washing machines has been a significant cause of the quality troubles referred to at the commencement of this report, and something must be done to rectify the position and substantially reduce the losses being sustained, both in the wastage of foodstuffs and in the financial return to the industry.. Producers should clearly understand that they cannot escape the financial loss concerned, and it would be erroneous for any producer to conclude that he is not affected because perhaps he obtained full price for his eggs which had not deteriorated when delivered to the packer (though some of them did later). The ultimate return to producers is governed by what consumers pay for eggs, and every bad egg destroyed means less money paid by consumers.

It is by no means impossible that some official action may have to be taken to regulate methods of cleaning used to avoid wastage, but it would be poor economy indeed to sit back and wait for what may come. What action, then, can be taken by each and every producer to do his share in eliminating this wastage which is causing so much loss of food and money?

Let us consider now the recommendations made in the Council for Scientific and Industrial Research report, to which we shall add some comments.

Recommendations

1. Every encouragement should be given to the methods of production *which will result in the greatest possible percentage of eggs being gathered naturally clean.* This means, of course, that the provision and maintenance of clean nesting material is of utmost importance, for the provision of naturally clean and attractive eggs also ensures eggs of unimpaired keeping quality.

2. It cannot be too strongly urged upon producers that eggs which are already clean when picked up should not be washed. It is quite a common practice for producers to pass all eggs gathered over cleaning machines, rather than take the time and trouble to separate out those which are soiled for washing. This practice subjects the clean eggs washed to equal risk of infection with the soiled eggs, and is definitely harmful.

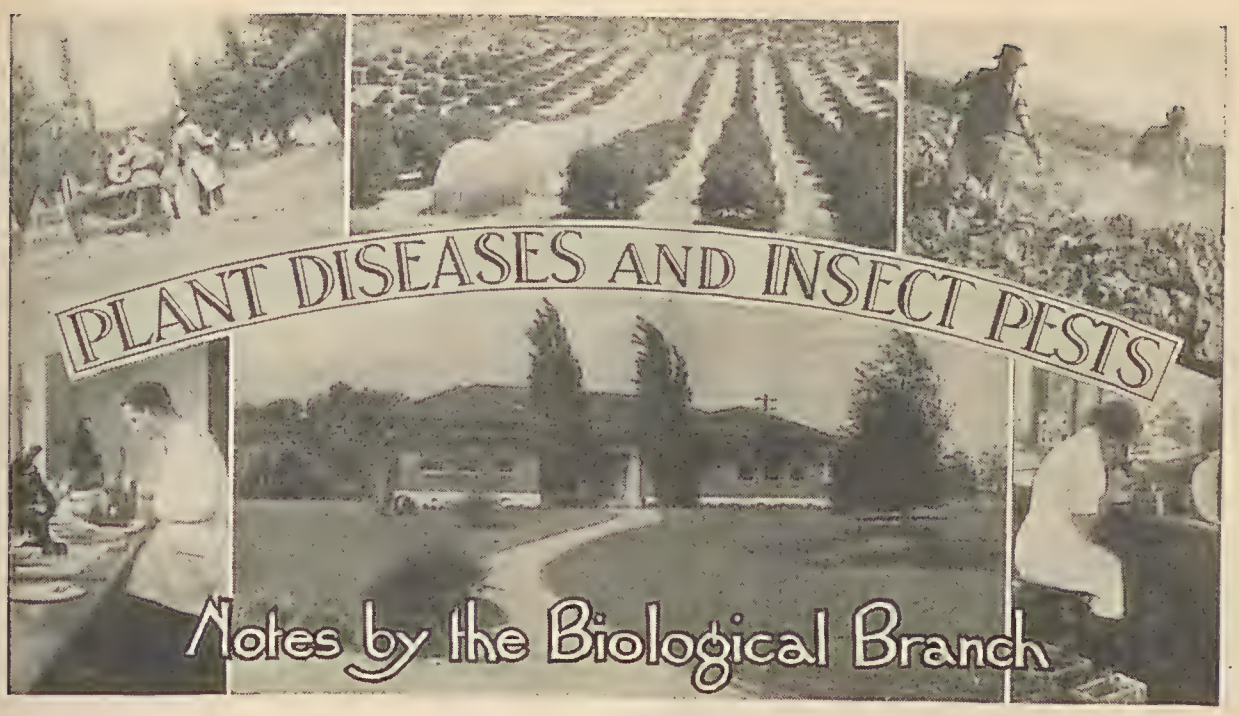
3. The hand-cleaning method, using frequent changes of clean water or "Evans" bucket method, is less liable to deteriorate keeping quality than washing machines, and should be used by producers to the maximum possible extent. While it is appreciated that washing machines save time on the farm and hand cleaning dirty eggs presents a problem of time and labour, this does not alter the fact that hand and bucket cleaning methods are the best at present available to the producer from the viewpoint of the subsequent keeping quality of the eggs. It is also necessary to emphasize that hand cleaning, like any other method can be abused by the use of dirty cloths, dirty water, and unhygienic handling generally, and to be successful requires care as does any other process carried out in farming.

4. The use of disinfectants on existing cleaning machines would effect a considerable measure of reduction in egg wastage, but a minimum effective concentration of disenfectants has yet to be determined. It must also be borne in mind that *all* disinfectants are not necessarily suitable, and that some are likely to injure the fabric of the machines. There is also the very important factor that an appreciable concentration of many disinfectants is unpleasant and may even be harmful to the hands of the operator handling the eggs and the fluid.

From all the foregoing it is obvious that while serious wastage is caused by the widespread use of washing machines, a simple and safe method of cleaning which can be put into universal practice is not easy to define. Yet the position must be improved for many obvious reasons. When machines are introduced into any industry to speed up handling of any product it is obvious that any injury sustained by the product must be taken seriously into account. The known methods shown to be most satisfactory from the point of view of the product itself have been indicated.

It may be that further developments may occur in the construction of cleaning machines; if so, success will be governed to a large extent by the ability of the designer to produce a machine which not only cleans eggs efficiently and quickly and with a very small percentage of cracks and breakages, *but which is so constructed as to offer no opportunity for harbouring bacteria which cannot be easily, effectively, and completely removed in the process of cleaning the machine.* It will also be necessary to ensure, of course, that the action of the machine does not induce any lodgment of bacteria on the eggs in any harmful way.

For the facts and conclusions contained herein, full acknowledgment is made to the Council for Scientific and Industrial Research, from whose report they have been extracted and summarized.



BROWN ROT OF STONE FRUITS

Brown rot disease of stone fruits, which is caused by the fungus, *Sclerotinia fructicola*, attacks peaches, apricots, plums, and cherries in this State and over the past twenty years, serious losses from this disease have occurred.

Brown rot not only causes a blossom blight and twig infection, but also infects the fruit while on the tree and also during and after transport to market.

Blossoms infected by this disease wilt and turn brown. Some remain attached to the tree and may develop spores on the dead flower parts from which subsequent fruit infection can occur. The fungus works up the blossom stalk into the twigs and may cause cankers on the wood, from which spores are also produced. If conditions for infection are favourable (that is a temperature of 70° to 80° F. and a high relative humidity) fruit infection may occur. The fruit is very susceptible to infection when nearing maturity, but infection may occur earlier in the fruit if conditions are favourable for prolonged periods and there is a heavy load of spore material in the orchard.

At this stage a grower may observe that his peaches, apricots, plums, and cherries develop small brown spots on the fruit, which rapidly increase in size until the whole fruit is brown. On the surface of the browned patch an ash-grey spore mass is produced. Such spores or seeds of the fungus are blown in the wind and in turn may infect sound fruit or fruit which has been injured from some cause.

Diseased fruits may fall to the ground, but usually some of them will remain attached to the tree. Such fruits will then mummify and the fungus will work up the fruit stalks into the twigs from which sporulation can occur. The

Brown rot blossom blight of peaches.

mummified fruit on the trees, if not removed, will sporulate from time to time, usually after every shower of rain, and constitute a very important source from which the fungus overwinters to produce blossom and fruit infection in the following spring. Dry conditions during the autumn and the winter favour copious sporulation from mummified fruits in the spring.

Under certain conditions, the infected fruit which falls to the ground may, if undisturbed, produce a fruiting body called an apothecium, from which spores are ejected into the air.

Apothecium of brown rot fungus (*Sclerotinia fructicola*).

Such fruiting bodies have been found in the Goulburn Valley, Victoria, and may occur at flowering time. If favourable conditions for infection coincide with spore ejection from the apothecia, blossom infection may occur from this source.

Control

Having regard to the above, it can be seen that there are certain measures which must be taken during the winter in the orchard, to prevent as far as possible the fungus from carrying over into the spring.

Such measures include the removal and destruction of all mummified fruits from the trees, and also the infected twigs to which the mummified fruits are attached. All such material should be burnt after pruning.

To prevent the formation of the apothecia from the infected fruits which have fallen to the ground, or which were discarded at picking time, it is necessary to disturb such fruit by ploughing or cultivating before the trees flower in the spring.

As apothecia have been observed within a few inches of the butt of the tree, it is also necessary to cultivate by hand the angular strips which are frequently left undisturbed after the orchard has been ploughed.

Apart from thoroughly carrying out such orchard sanitation as outlined above, all the stone fruit trees should be sprayed with Bordeaux mixture 6 : 4 : 40, just as the buds swell in the spring.

For peaches, plums, and cherries this should be applied not later than very early bud-burst stage.

For apricot trees which have previously been affected with Brown rot, two applications of Bordeaux mixture should be applied, one at the pink bud stage and the second at the pink-white bud stage.

This sanitation, coupled with pre-blossom Bordeaux spraying, will reduce damage caused by Brown rot blossom blight.

To protect the fruits of peach, plum, and cherry from infection, they may be sprayed with sulphur cover sprays. In this regard, dry-mix lime and sulphur has been found to be an effective, safe, and cheap spray.

This spray which was originally developed at New Jersey Experiment Station, has given satisfactory

Mummified cherries, peaches, and plums which must be removed from the trees at pruning time, and destroyed.

control, as a Brown rot and Rust cover spray for peaches, in experiments conducted by the Biological Branch of this Department in the Goulburn Valley. This material consists of 16 lb. of air blown sulphur, 8 lb. of fine grade hydrated lime and 1 lb. of lime casein spreader and is used at the rate of 25 lb. of the mixture to 100 gallons of water.

This spray should be applied periodically to the trees after the fruit has formed, and during subsequent fruit development, to protect it against infection. It should not, however, be applied closer than six weeks from fruit maturity, except on peaches for canning, as the spray deposit affects the general appearance of the fruit for market. This cover spray programme will also protect the fruit from brown rot infection during transport and marketing.

It is important to note that sulphur sprays in any form must not be used on apricot fruits because of the serious risk of injury. In the case of apricots, there is no satisfactory fruit cover spray known which it is safe to use, hence apricot growers must rely on the thoroughness of winter sanitation in the orchard and the two pre-blossom Bordeaux mixture sprays, to give some measure of control against Apricot Brown Rot.

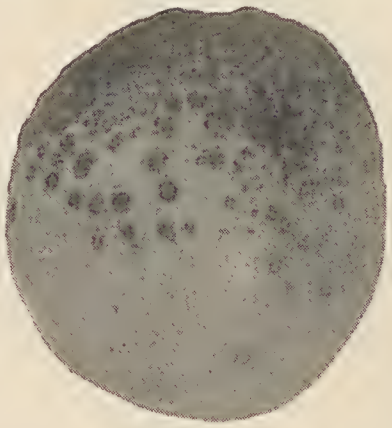
APRICOT SCAB OR SHOT HOLE

Apricot Scab or Shot Hole, which is caused by the fungus *Clasterosporium carpophilum* affects the leaves, buds, and fruit. The affected fruit is unfit for marketing in the fresh state, and is quite unsuitable for canning. Before proper control measures for this disease were adopted in the Goulburn Valley stone fruit irrigation areas, growers in many instances found apricot growing unprofitable.

The disease, which appears on the fruit usually after a period of humid or wet conditions in October, develops as crimson spots on the exposed side of the fruit; later these spots further develop and become hard and scabby.

The fungus also attacks the leaves. The leaf reacts against infection and the diseased area is cut out, thus producing the characteristic "shot hole" effect.

During the autumn, winter, and spring, provided conditions are favourable for infection, the fungus will kill the buds. The spores in between the bud scales germinate and infect the buds, which then become black and shiny. It is from the spores which are carried between bud scales that the fungus overwinters and infects the leaves and fruit in the following spring. Experimental work conducted by the Biological Branch of this Department on the control of this disease under Goulburn Valley conditions showed that



Apricot scab.

thorough spraying with Bordeaux mixture 6 : 4 : 40, applied just as the final leaves are falling (about the end of May), and again at the pink bud stage (about the middle of August), reduced the percentage of infected apricot fruits in three years from 77 per cent. on unsprayed trees to 2 per cent. on trees which had received the above spray programme.

For commercial growers Bordeaux mixture may be prepared by dissolving 12 lb. of finely crystalline copper sulphate in 72 gallons of water in an 80-gallon spray vat. Then mix 12 lb. of hydrated lime with 8 gallons of water, start the agitators on the vat and slowly pour the lime solution into the vat. If a small quantity of the spray (say 10 gallons) is required by home gardeners, it is made up as follows:—Dissolve 1½ lb. of copper sulphate (the small crystalline form dissolves more readily) in 5 gallons of water in a non-metallic vessel. In another vessel dissolve either 1½ lb. of hydrated lime or 1 lb. of quick lime in another 5 gallons of water. Then mix the two solutions together by pouring them simultaneously into a third non-metallic vessel. The mixture, which should be sky-blue in colour, may then be put into a bucket pump provided it is sprayed out immediately.

WOUND DRESSINGS FOR FRUIT TREES

There is a number of fungi capable of attacking fruit trees through wounds. These fungi gradually kill the affected branch, and, if not checked, may ultimately destroy the whole tree.

Apricot wood infected with *Polystictus versicolor*.

Fungi of the *Polystictus* group cause a dry type of wood rot. The first symptom likely to be noticed by the grower is the death of the foliage on the affected limb. The bark also separates from the limb giving a symptom which has been aptly called "paper bark". At certain times of the year shelf-like fruiting bodies develop. Those of *Polystictus* (*Trametes*) *cinnabarinus* are reddish orange in colour, while those of *P. versicolor* vary in colour from a creamy shade to various shades of brown. The upper side of the fruiting body of *P. versicolor* is velvety in texture and has a zoned structure. The underside of the fruiting bodies of both these forms is composed of a large number of pores in which the spores (or "seeds") of the fungus are produced.

The first symptom of the Silver Leaf disease *Stereum purpureum*, which attacks apricots and plums more commonly than other fruit trees, is a silvering of the foliage of the affected limb. The fruiting bodies of this fungus are flat fungal growths which have a characteristic purplish tinge.

The disease known as Black Heart *Verticillium sp*, which is mainly a disease of apricots, does not cause rotting of the wood. The first obvious symptom of the disease is the death of the foliage on the affected limb. If the limb of an infected tree is cut, a black discoloration of the wood will be observed.

Control

The control of all these diseases is essentially similar. All gain entrance to the tree through large wounds caused during pruning or by wind or other mechanical means.

The treatment for such wounds is simple, and should be made a routine measure by every orchardist, particularly in those areas where such diseases are known to be present. All wounds over half an inch in diameter should be trimmed with a sharp knife and then painted with bituminous paint or white lead paint. Bituminous paint is preferable as white lead tends to crack, when the coating must be renewed. Other materials, such as tar or creosote, are less satisfactory since they are likely to injure the tissues of the tree.

Prevention is much better than cure with all these diseases. If infection develops, the limb must be removed beyond the last sign of diseased tissue. The cut should then be trimmed and treated with one of the dressings mentioned above.

WOOLLY APHIS

While the present period of the year is not the one during which the most obvious signs of Woolly Aphis attack on apple trees can be seen, it is nevertheless a very satisfactory time for applying dormant sprays to reduce the infestation to a minimum before the commencement of spring.

The damage to apple trees is fairly well known, the most conspicuous feature being the presence

Left—Wilting of apricot foliage caused by Black Heart disease.
Right—Black discoloration of apricot wood caused by the Black Heart fungus.

Silver leaf fungus on the limb of an apricot tree.

of large clusters of whitish cottony threads covering the bodies of the aphids. As the result of the feeding of the aphids and the irritation set up in the tree by this feeding, galls or excrescences are formed, upon which the aphids are to be found clustered by the hundreds. The general vitality of the tree is reduced by their sucking activities, and the galls make suitable places for attack by borers and wood destroying fungi.

The areas on a tree most susceptible to attack consist, firstly, of freshly pruned surfaces or partially healed scars, and secondly, grafting areas or wounds, although any damaged area lends itself to attack.

While for some years, satisfactory control of this insect was obtained by the use of the parasite, *Aphelinus mali*, of more recent years the control has not been so satisfactory, and additional measures have been necessary.

The most effective of these secondary measures can be carried out in the winter when, with the absence of leaves on the trees, it is much easier to reach with sprays the clustered woolly masses of aphids.

The spray to be used should be a red oil at a strength of 1 in 20, with or without nicotine sulphate. If the nicotine sulphate is included, the mixture should be in the following proportions:—

Red oil	1 gallon
Nicotine sulphate	1 pint
Soft soap..	1 lb.
Water	80 gallons

Either of these two sprays should be applied to the trees under high pressure, and in order to obtain the maximum results, the spray nozzle should be held close up to the affected parts so that the woolly coverings over the aphids will be blown away, and the masses of aphids broken up.

Experimental work in New Zealand has indicated that a spraying with red oil does not adversely affect the parasites, since, during the winter months, the majority of them are protected within the bodies of the aphids.

COCKCHAFERS IN LAWNS

During recent weeks, there has been abundant evidence that cockchafer grubs have been very active in lawns and parks, as well as in pasture paddocks in the country.

Woolly aphis on old pruning scars.

In lawns and parks, the species most frequently found is the Common Pasture Cockchafer, *Aphodius howitti* Hope, and this is the insect that is throwing up the large numbers of mounds of earth at the present time. Where these insects are very numerous, the amount of earth thrown up may be so extensive that the whole grassed area is covered over, and the grass either destroyed or weakened.

Permanent control of these cockchafers is obviously very desirable and, while at the present time we know of no permanent method for pastures, it can be accomplished on lawns by the use of arsenate of lead powder applied as a topdressing. On lawns less than one acre in extent, 5 lb. of arsenate of lead powder mixed with 1 bushel measure of moist screened sand or soil, and broadcast over each 1,000 square feet of turf will, in a comparatively short time, give immunity from grubs in that lawn for several years. This topdressing should take place as early as possible in the autumn, and should be timed, if possible, so that it is completed before a good fall of rain. Under these conditions, the control of cockchafers becomes apparent very rapidly owing to the fact that the arsenate of lead is washed to the roots of the grasses almost at once. If natural rainfall does not occur shortly after the topdressing, it would be advisable to artificially water the poison in.

Mowing, watering, &c., may be continued after treatment, but fertilizers containing nitrate of soda, superphosphate, sulphate of potash, or potassium chloride, should not be applied, as they react with the lead arsenate and reduce its effectiveness. Other materials, such as well-rotted manure, blood and bone, sulphate of ammonia and organic meal manures may be used.

In order to maintain the full amount of arsenate of lead necessary in the soil, and to prevent the layer of poisoned soil being gradually buried by the regular application of topdressing, lead arsenate should be applied with each topdressing at the rate of ½ lb.–1 lb. per 1,000 square feet.

Lead arsenate should not be applied to grasses such as Winter Grass, *Poa annua*, and Meadow Grass, *Poa trivialis*, which are commonly found growing in shady situations or too heavily shaded turf.

COCKROACHES

In Victoria, three species of cockroaches are met with in houses. They are the American Cockroach, *Periplaneta americana* L., the Oriental Cockroach, *Blatta orientalis* L., and the German Cockroach, *Blatella germanica* L. Of these three, the Oriental Cockroach is the most commonly found inside the house, while the American Cockroach, although found in houses, is most usually seen around rubbish tips.

In general colour, cockroaches range from brown to black, measure from half an inch in length with the tan coloured German Cockroach, to 1½ inches with the large brownish-black American Cockroach. They are well known to most housewives and storekeepers by their foul smell, which seems to taint any food with which they come in contact. They are chiefly night moving species, and prefer a warm spot near stoves, heaters or hot water pipes to shelter during the daytime. The small brownish pod-like egg cases of cockroaches are often the first indication of the presence of these insects in a house.

Their food tastes are very variable, they will attack almost any uncovered food stored in pantries, bakeries, etc., while in addition they foul additional food with their excreta. On occasions, they will attack the leaves and bindings of books and magazines.

The most effective material to use for their control is sodium fluoride, which is the active constituent of a number of cockroach powders. This material should be dusted liberally wherever cockroaches frequent, e.g., the dark corners of

Note how turf can be rolled up as a result of root injury by Cockchafers.

[*Continued on page 372.*

Wartime Cooking at Home

By RACHEL M. PEILE, Fruit Preserving Expert

WHEREVER possible grow your own food. Regulate planting so as to have a constant supply of vegetables throughout the year. It is a good idea also to preserve vegetables when they are plentiful. Most vegetables may be bottled or dried and some may be stored in the ground.

Fruits also can be grown in great variety and the products bottled or dried. A lemon tree is a great asset to any home garden.

In wheat-growing areas, breakfast porridge from cracked wheat can be prepared cheaply and is more valuable than patent foods. A meat mincer or hand mill will grind wholemeal flour. Bread made at home (compressed yeast can be obtained from the Housewives Association at 3d. an ounce) will mean a saving as will the use of treacle, which is rich in iron.

Potatoes can be used extensively and if cooked in their jackets are a source of minerals which are so important in body building.

Cheap cuts of meat are as nutritious as expensive ones and can be served in many appetising ways.

When cooking vegetables, never throw away the water in which they have been cooked. Use it for stews, soups or gravies. The peels of young, fresh root vegetables are particularly rich in minerals, and should not be peeled or scraped off unless it is absolutely necessary.

When eggs are scarce, use egg powder. When making cakes and puddings this is a good substitute.

Six economical recipes are given below. They include the use of bottled and dried fruits, wholemeal flour, vegetable water, and a recipe for eggless cake.

Pumpkin Soup

¾ lb. of pumpkin.
Piece of onion, turnip, and celery.
2 level tablespoons of flour.
1½ pints of stock, water, or vegetable water.
¾ cup of milk.
Salt, cayenne pepper.

Prepare vegetables, cut up roughly and place into saucepan with stock or water. If it can be spared, add one level dessertspoon of sugar, as this helps to give all soups a lovely flavour. Bring to boil and simmer gently until tender (about 40 minutes). Rub through a sieve. Return all to saucepan. Blend flour with a little cold water; add to soup and stir till boiling. Cook three minutes longer. Add milk and reheat *without boiling*. Garnish with a few cooked peas or chopped parsley.

Casserole of Mutton and Split or Dried Peas

1 lb. forequarter chops, or any other part of the forequarter.
2 oz. soaked overnight, dried, or split peas.
½ pint stock or vegetable water.
Pepper, salt, chopped parsley to taste.
¼ lb. French beans, finely cut.

Trim excess fat from meat and cut into small neat pieces. Place on top of dried or split peas and flavourings in casserole. Add stock or water. Pour boiling water over prepared beans, and add to casserole. Dried French beans may be used, but they should be soaked overnight in cold water before using. Place lid on and cook till tender in a moderate oven.

Peach Slices and Milk Gelatine, using Bottled Peaches

Open one jar of preserved peaches and place a layer of them evenly in the bottom of a round mould and set in place with a little jelly. In addition, the following ingredients are required:—

1 pint milk.
¼ oz. gelatine.
Flavouring.
2 or 3 oz. sugar.

Warm the milk. Add the gelatine and sugar and flavouring. When quite dissolved gently pour into the mould on top of the jellied peaches.

Orange Roly

Sieve half a pound of wholemeal self-raising flour and a pinch of salt together. With tips of fingers rub in two level tablespoons of clarified dripping. Add dessertspoon of sugar. Mix to a dough with a cup of milk or water. Roll out half an inch thick.

FILLING.

Grate rind of one orange, remove outside white pith and chop orange into small pieces. Mix all together with a cup of raisins or other dried fruits. Spread pastry with a layer of golden syrup, treacle or honey. Cover with filling and fold up. Pinch edges together and place in baking dish. Cream together two tablespoons of brown sugar and one tablespoon of butter. Spread over roly; surround with water (two tablespoons) and bake 30 minutes.

Eggless Cake

2 cups plain flour.
1 cup sugar.
¼ lb. butter or good beef dripping.
1 tablespoon vinegar
A little milk.
1 large cup of fruit.
1 teaspoon carb. soda.
2 teaspoons mixed spice.
A little mixed peel.

Rub butter into flour, and add sugar, spice, and soda dissolved in a little milk. Add fruit. Mix well. Add vinegar. Put in cake tin lined with greased paper. Bake 45 to 60 minutes in moderate oven.

Tomato Pie

Pastry.
Grated cheese.
Tomatoes.
Salt, pepper.

Grease a tart plate and line it with rather thin pastry. Cover with a good layer of grated cheese, then place slices of tomato on the cheese and season with salt and pepper. A little grated onion may be added if a strong flavour is desired. It is worth while to skin the tomatoes before slicing. Sprinkle another layer of cheese over the tomatoes, then cover with thin pastry and bake for about 20 to 30 minutes. Bottled tomatoes may be used.

Using Up Left-overs

Porridge.—Use for the thickening of soups and stews. Thin it down with milk and strain for invalid gruel.

Cooked Eggs.—Use in pies and sandwiches.

Meats.—Rissoles, shepherds' pies, curries, stews; but remember: Do not cook, simply reheat.

Vegetables.—Vegetable pies or rissoles; add to scones; soups made from vegetable purees; cover with thick sauce and cheese and cook.

Cake and Breadcrumbs.—Trifles, puddings, custards.

Bread and Breadcrusts.—Make breadcrumbs; cut into croutons and bake in oven, then store till required; stuffings; puddings.

Vegetable Water.—Stocks, soups, and stews.

Bones and Fresh Meat Scraps.—Stock.

Fish.—Savoury fish dumplings cooked in fish stock; pies and patties. Reheat in cheese sauce.

BIOLOGICAL NOTES—*Continued from page 370.*

cupboards, under sinks and around hot-water pipes. The cockroaches do not feed directly on this powder, but get it on their body and legs when walking over it, and in cleaning themselves later they take the material into their stomachs and are then poisoned. It must be kept in mind that sodium fluoride is poisonous, and therefore should not be dusted directly on to food, and should be kept out of the reach of children or irresponsible persons.

Cockroach.

In light infestations, successful control can be obtained by the liberal use of liquid pyrethrum "fly-sprays," sprayed into any places where the cockroaches may be hiding.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East ..	154
Ballarat Orphanage ..	Ballarat	135	Northcote Children's Farm	Bacchus Marsh ..	156
Banyule Stud Pty. Ltd.	Wangaratta ..	31	Onley, W. H. ..	"Glenholme," Caldermeade	55
Black, I. S., Estate ..	Mount Noorat ..	53	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Clarke, A. B. ..	Glenormiston South	15	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dennis, Mrs. A. A. ..	Frankston ..	33	Poole, M. A. and D.	Caldermeade ..	134
Dookie Agricultural College	Dookie	85	Poole, M. A. and D.	Yannathan ..	72
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Powell, T. S. ..	"Carellen," Mansfield	46
Geelong Grammar School	Corio	68	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	35	Samuel, Misses G. and E.	Lang Lang ..	48
Gorman, A. W. ..	"Cathcart," Alexandra	61	School of Horticulture	Burnley	10
Hollaway, R. W. ..	Caldermeade ..	75	State Experiment Farm	Rutherglen ..	40
Kilmany Park Farm Home for Boys	Sale	104	State Research Farm	Werribee	229
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	Tanner, N. J. ..	Pakenham ..	33
Longerenong Agricultural College	Dooen	43	Vagg, T. E.	Officedale ..	45
			Wells, W. G. ..	Caldermeade ..	65

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Anderson, J. B. ..	Warrnambool ..	19	Bunting, J. ..	Epping	35
Andison, J. A. ..	Thomastown ..	46	Burke, T. S. ..	Huntly	19
Andrew, J. C. ..	Whittlesea ..	121	Butler, W. ..	Wallan	49
Andrew, W. ..	Whittlesea ..	160	Callaghan, L. ..	Epping	34
Andrews, E. H. ..	Templestowe ..	19	Carr, W. J. ..	Wollert	65
Barclay, A. H. ..	Whittlesea ..	107	Cavagna, Miss ..	Sedwick	7
Barker, Mrs. E. M. ..	Huntly	11	Child, G. P. ..	Epping	53
Bates D. S. ..	Whittlesea North ..	25	Christian Bros. ..	Doreen	42
Batten, R. J. ..	Wollert	44	Clark, P. W. ..	Whittlesea ..	62
Benson, R. ..	South Morang ..	35	Collins, L.	Doreen	48
Bodycoat, A. ..	Wollert	39	Cornfoot, D. H. ..	Whittlesea ..	43
Booth, Mrs. A. ..	Warrandyte ..	7	Coulthard, J. J. ..	Whittlesea ..	76
Bourke, G. J. ..	Fairfield	82	Crack, Mrs. E. ..	Bendigo	12
Bourke, J. W. ..	Somerton	37	Craker, Mrs. E. ..	Warrandyte ..	2
Bradbury, A. K. ..	Diamond Creek ..	50	Crowle, A. J. ..	California Gully ..	16
Bradbury, G. ..	Kangaroo Flat ..	20	Cumming, H. R. ..	South Morang ..	23
Brereton, E. ..	Kennington ..	25	Cunningham, E. C. ..	Templestowe ..	23
Browell, L. ..	Golden Square ..	15	Cupris, A.	Bullock Creek ..	31
Brown, Mrs. A. ..	Maiden Gully ..	11	Danaher, J. V. ..	Whittlesea ..	70
Brown, R.	Kennington ..	4	Danns, N. C. ..	Whittlesea ..	34
Brownhill, C. E. H. ..	Bundoora	34	Deutscher, H. W. ..	Mernda	168
Bryden, A. C. ..	Bendigo	17	Doggett, T. ..	Kangaroo Flat ..	17

Name.	Address.	Number in Herd at Last Test.
Dillon, L. W.	Epsom	18
Draper, L. S.	Wollert	31
Drysdale, J. C.	Warrandyte	41
Dunstan, W.	Pascoe Vale	32
Fergusson, M. A.	Whittlesea	92
Fitzsimons, B.	Lower Templestowe	33
Flanagan, A. D.	Epsom	10
Flynn, O.	Epsom	21
Fox, A.	Mernda	59
Friswell, H.	Bendigo	42
Galbraith and Walker	Greensborough	36
Gallagher, J.	Golden Square	20
Gallus, E. A.	Doncaster	14
Gamble Bros.	Greenvale	156
Gardiner, A. M., Estate of	Whittlesea	73
Gardiner, C. E.	Epping	20
Gentner, H.	Eaglehawk	9
Gibbs, C.	Arthur's Creek	30
Gindice, J. J.	Kangaroo Flat	17
Goodman, A. E.	Broadmeadows East	55
Goulden, J. B.	Wilson's Reef	54
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, W.	Mernda	11
Gunn, W.	Kangaroo Flat	10
Hall, Mrs. J. E.	Whittlesea North	13
Hamilton Bros.	Huntly	17
Hancorne, Miss M. R.	Yan Yean	34
Harding, J. E.	Templestowe	42
Hawkes, Miss D.	Warrandyte	21
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Howell, G. G.	Wollert	221
Hoy, T.	Kennington	26
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Jackson, Mrs. M.	South Warrnambool	6
Janefield Farm	Bundoora	43
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
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Miller Bros.	Greensborough	44
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Mosig, H. C.	Epping	26
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Nash, H. A.	Tullamarine	41
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O'Keefe, J. P.	Warrnambool	21
Parker, Mrs. A. E.	Greensborough	24
Parker, R. H.	Craigieburn	91
Patullo, F. E.	Mickleham	36
Pearce, A. E.	Mandurang	55
Pearce, J.	Mandurang	24
Pentland, E.	Maiden Gully	8
Pentland, F. C.	Marong	26
Pilcher, W.	Kangaroo Flat	13
Pitson, R. H.	Yarrambat	19
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	48
Rawlings, J. H.	Whittlesea North	41
Rodgers, E.	Whittlesea North	14
Rosewarne, Miss P.	Yan Yean	40
Rowe, Mrs. M.	Eaglehawk	19
Ruff, A.	White Hills	12
Salathiel, R. W.	Big Hill	14
Scheuffele, C.	Epsom	24
Seeber, B.	Thomastown	28
Semmens, J. H.	Sedgwick	18
Shaw-Logan T.	Glenroy	103
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Skals, P.	Rosanna	28
Smirfitt, J. E.	Epping	39
Smith, G. A.	Templestowe	63
Smith, H. H.	Heidelberg	33
Smith, J. R.	Mernda	34
Smith, L. W. W.	Bundoora	81
Smith, M.	Heidelberg	43
Smith, R. A.	Epping	26
Smith, S. E.	Epping	33
Southon, H. W.	South Morang	60
Spruzen, G.	Wollert	41
Stephens, H.	Epping	48
Stimson, T.	Woodstock	33
Story, T.	Mandurang	24

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Thomas, Mrs. E. ..	Broadmeadows ..	11	Whitelock, E. A. and E. J.	Epsom	23
Thomas, Mrs. V. E.	Yan Yean ..	31	Whitfield, A. E. ..	Bendigo	6
Toman, Mrs. A. ..	Golden Square ..	11	Whittingham, E. W.	Greensborough ..	41
Towt, C. W. ..	Glenvale	136	Wicks, C.	Golden Square ..	18
Trahair, R. ..	Maiden Gully ..	49	Williams, E. A. ..	Thomastown ..	32
Trethewey, R. T. ..	Epsom	7	Williams and Berryman	Bendigo	15
Trethowan, F. W. ..	Donnybrook ..	94	Williamson, J. ..	Doncaster (High-st.)	4
Trist, H. P. ..	Greensborough ..	8	Willis Bros. ..	Craigieburn ..	61
Troutbeck, H. R. ..	Mickleham ..	47	Wilson, J. E. ..	Diamond Creek ..	9
Twomey, A. ..	Greenvale ..	39	Wilson, Mrs. M. ..	South Morang ..	14
Vallence, C. A. ..	Epping	19	Wrest, W.	Epping	77
Van, E. L. ..	Templestowe ..	28	Wuchatsch, J. D. ..	Epping	14
Wheeler, W. A. ..	South Morang ..	34	Yann, R.	Wollert	52
Whelpton, B. ..	Whittlesea North ..	59	Ziebell, H. ..	Thomastown ..	32
White, W.	Greensborough ..	17			

There are also 770 herds in which 15,479 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture.*

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Date of Certification.	Number of Birds.
J. L. Fry, Clematis Stud Poultry Farm, 858 Heidelberg-road, Alphington	10.2.43	166
M. A. Jones, Ringwood	22.2.43	352
Reformatory Prison, Castlemaine	3.3.43	299
F. W. Becker, Follett-road, Cheltenham	4.3.43	293
Mrs. C. Penn, Mayfield Poultry Farm, 53 Cromer-road, Beaumaris	15.3.43	527
Ridge and Son, Blackburn	17.3.43	682
Mrs. W. Davidson, Sherbrooke-avenue, Ringwood	24.3.43	103
Anthony Hamilton, "Lyncroft," Flinders	24.3.43	995
John J. King, New Gisborne	24.3.43	48
C. P. Salathiel, Hewitt's Poultry Farm, Skene-street, Bendigo	24.3.43	514
Stanley Wohlers, Box 12, Jung	24.3.43	199
Miss M. T. Gartner, "The Pines," 259 Middleborough-road, Box Hill	2.4.43	119
E. J. Greenshields, Lancefield	2.4.43	221
Alfred E. Hill, 26 Brenbeal-street, Balwyn, E.8	2.4.43	76
H. Mulconry, Callender-road, Noble Park	2.4.43	79
A. Sanders, Boronia-road, Wantirna	2.4.43	367
Frank W. Bentley, Hastings-road, Frankston	6.4.43	592
Mrs. M. A. Godfrey, "The Wattles," Healesville	6.4.43	271
C. W. Henderson, Shepparton East	6.4.43	367
Mrs. M. F. Skinner, Prince's Highway, Noble Park	14.4.43	81
E. Bartlett, Pimpinio	14.4.43	273
A. Counsell, Koomba-road, Wantirna	16.4.43	248
H. Everard, Hawkesdale	16.4.43	382
J. L. Mead, 28 Golf Links-avenue, Oakleigh, S.E.12	16.4.43	81
W. E. Molson, 188 Blackburn-road North, Blackburn	16.4.43	599
K. A. McLaughlin, "Dandevue Poultry Farm," Central-avenue, Bayswater	16.4.43	730
E. G. Vogt, McSwain-street, Mentone, S.11	16.4.43	165
R. Shipp, P.B., Kerang	22.4.43	454
J. E. Coupar, Box 18, Nathalia	3.5.43	458

Owner.	Date of Certification.	Number of Birds.
D. Costos, cr. Collins and Waverley Roads, Oakleigh, S.E.12	3.5.43	769
Miss K. M. McLeod, "Hayfield," Diggers Rest	3.5.43	196
John Rae, 277 Albert-street, Sebastopol	3.5.43	1,736
Alex. Donald, "Ivyleigh Poultry Farm," New Gisborne	3.5.43	405
Mrs. J. E. Lennie, Mt. Scobie, via Kyabram	3.5.43	88
R. P. Gwyther, Valley-road, Highton, Geelong	10.5.43	294
Messrs. R. R. Christie and Son, St. Elmo Poultry Farm, Tucker-road, Bentleigh, S.E.14	10.5.43	728
Wm. Kenneally, Hallam-road, Hampton Park, via Dandenong	10.5.43	170
Mrs. R. Evans, 50 Simpson-street, Kyneton	10.5.43	101
G. D. Simpson, May-road, Glen Waverley	10.5.43	695
E. Smith, "Stapely," Valley-road, Highton, Geelong	10.5.43	211
John A. Stewart, Maldon-road, Castlemaine	10.5.43	653
J. C. Wimhurst, Tongala	10.5.43	398
R. S. Youl, "Wycherley" Stud Poultry Farm, Wedderburn	10.5.43	817
Walter C. Mackintosh, Neerim South	12.5.43	613
R. E. Throup, Neerim South	12.5.43	199
V. Williams, "Wangaratta Hatchery," 91 Tone-road, Wangaratta	12.5.43	448
Messrs. Hines Bros., Traynor's Lagoon, via St. Arnaud	12.5.43	1,300
F. J. L. Abernethy, Box 108, Horsham	13.5.43	445
A. W. Poulton, Vickers-street, Sebastopol	13.5.43	255
Geo. Winter, "Denehurst," Murgheboluc	13.5.43	293
J. Aitken, Silver-street, Cheltenham, S.22	13.5.43	900
P. Nemet, Spring Vale-road, Spring Vale	13.5.43	797
Messrs. F. S. Cox and C. P. West, Grange-road, Cheltenham	13.5.43	223
Messrs. Stiles Bros., "Fair View Poultry Farm," Wallan	13.5.43	795
Wm. Davis, New Gisborne	13.5.43	28
H. M. Bantick, Old Dandenong-road, Heatherton	21.5.43	276
Allan E. Maher, "Alandale," Wal Wal	21.5.43	987
N. C. Throup, Neerim South	21.5.43	31
Geo. Lucas, 4 Downing-street, Blackburn	21.5.43	377
G. Massie, "Nardo Poultry Farm," 127 Hayes-street, Shepparton	24.5.43	1,402
G. W. Grenville, "Grenville Stud Poultry Farm," Springvale South	24.5.43	2,180
Mrs. E. H. Walker, Lancefield	24.5.43	126
A. E. Hemphill, "Glenara Poultry Farm," Monegetta	24.5.43	441
A. S. Johnson, Burwood-road, Lower Ferntree Gully	31.5.43	567
J. Sweeney, "Tarara Poultry Farm," 55 Rundle-street, Ararat	31.5.43	238
H. N. Clark, "Clydesdale Poultry Farm," Bayswater-road, Croydon	31.5.43	2,011
R. A. McDonald, "Barton," Moyston Post Office, via Ararat	31.5.43	114
J. A. Rushton, "Rushton's Electric Hatcheries," 11 Barker-avenue, Shepparton	31.5.43	772
R. R. Hunt, 365 Highbury-road, Burwood, E.13	31.5.43	462
D. M. Armstrong, Fryer's-road, Campbell's Creek	3.6.43	178
L. H. Eastman, 52 Landell's-road, Pascoe Vale	8.6.43	764
D. McKay, 47 Landell's-road, Pascoe Vale	8.6.43	750
E. W. Kosch, Coromby	8.6.43	389
R. M. Clegg, 52 Burns-street, Hamilton	8.6.43	31
W. R. Major, Girgarre	10.6.43	75
C. H. Thomas, 325 Highbury-road, Burwood	10.6.43	219
W. Dimoline, Heatherton-road, Noble Park	10.6.43	358
G. J. White, The "Allwell" Stud Poultry Farm, Watson's-road, Glen Waverley	10.6.43	541
Mrs. M. E. Barber, Blackwood Park-road, Lower Ferntree Gully	10.6.43	109
J. M. Sutherland, Fulton-road, Box Hill	10.6.43	899
W. G. Nichols, Wandong	14.6.43	115
E. D. Taylor, Walker-street, Sebastopol	14.6.43	2,002
Norman Hockley, Coleraine-road, Hamilton	14.6.43	48
G. Ridgway, Callander-road, Noble Park	14.6.43	143
Messrs. C. and H. Jackson, Cadles-road, Carrum Downs, via Frankston	14.6.43	140
Mrs. H. F. Pearse, Box 33, Donald	14.6.43	279
R. McCabe, "Poplar Hatchery," Gladstone-road, Dandenong	14.6.43	1,447
A. Barnes, "The Heights Poultry Farm," Blackburn-road, Blackburn	15.6.43	1,972
T. L. Eastaugh, Point Nepean-road, Highett, S.21	15.6.43	448
L. J. Mumford, Steele-street, Healesville	15.6.43	395
L. S. Lowe, "Callemondah," Central-avenue, Bayswater	15.6.43	175
F. C. Newparth, Croydon North	16.6.43	104
H. A. Moore, Warrandyte-road, Ringwood North	16.6.43	321
Dookie Agricultural College, Dookie	17.6.43	614

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Issued by direction of the Hon. N. A. Martin, M.L.A., Minister of Agriculture.

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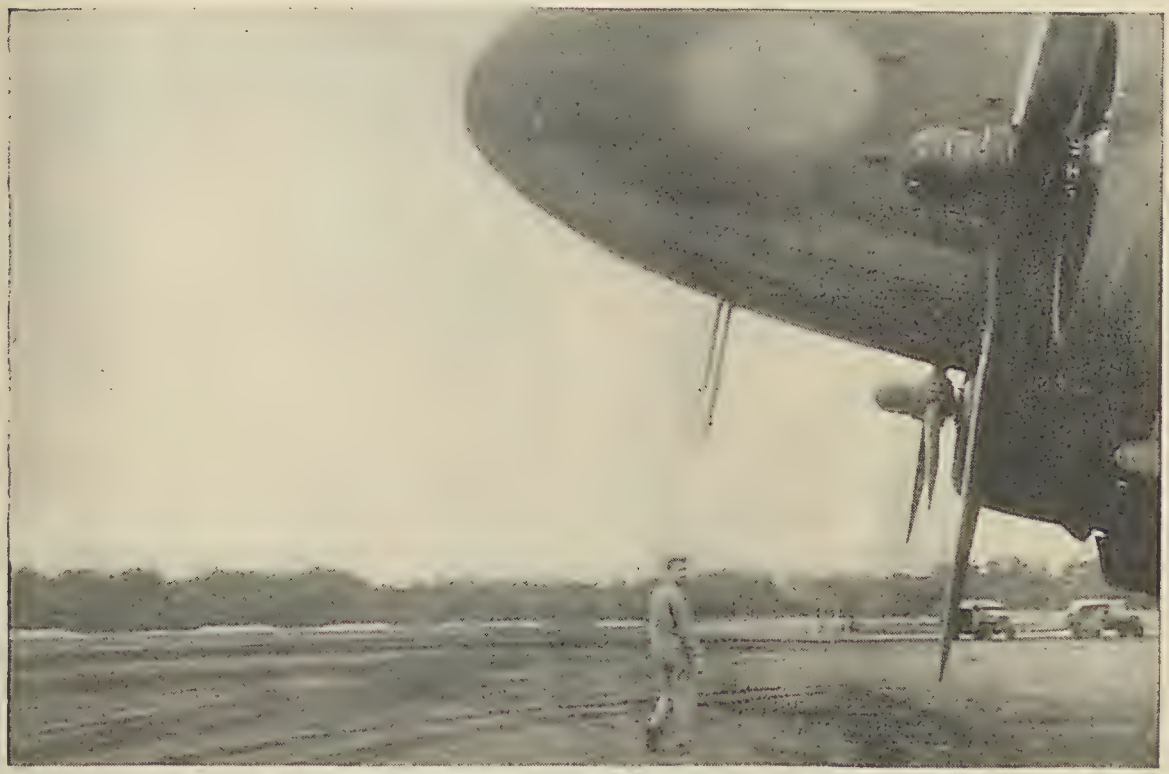
Woodend Bent Grass

Seed Wanted for Aerodromes

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist



A good grass cover is desirable on an aerodrome. Heavy aeroplane traffic and the action of propellers will damage an unprotected earth surface. [*Dept. of Information photo.*

THE Department of Air has asked the Department of Agriculture to organize the production of seed of "Brown top" grass. This grass is a species of Agrostis or Bent Grass and is required by the Department of Air for the grassing of aerodromes in localities where conditions for the grass are favourable.

"Brown top" is a European native introduced many years ago, generally accidentally, as an impurity in pasture grass seeds. In cool wet climates on heavy soils it flourishes and has proved most aggressive in some Victorian localities in the 30- to 40-inch rainfall zones.

"Brown top" is not a good pasture grass and most farmers realize its limitations for grazing—they give it the disparaging name of "twitch" or "couch" grass, a descriptive name which is applied to several grasses with a creeping habit of growth.

The features which make this grass a nuisance from an agricultural point of view invest it with a particular value where a grass sward is wanted. For lawns, playing grounds, golf courses, &c., and now, for aerodromes, it is highly valued as a turf-forming grass. The main disadvantage is that it will not grow naturally outside particular zones.

Species of Bent Grass including "Brown top" are common elements in lawn grass mixtures—and every greenkeeper knows that sedulous care is required to maintain these grasses in most districts. This point is emphasized because the Department of Agriculture has been

warned that it may be a grave mistake to propagate this grass in districts where it is not now common.

Bent Grass is very widely distributed now where climate favours it, but it becomes dominant because poor soil conditions or lack of grazing management favour it. Where conditions favour better pasture elements there is no brief for Bent Grass as a pasture grass. In fact, in Bent Grass country, some cropping or cultivation of improved pastures is necessary to supplement the limited grazing from the natural grass swards.

In unfavourable seasons, Bent Grass is grazed close, but when other feed is abundant it is more or less neglected and grows 12 to 18 inches high. Under such conditions there are opportunities for seed harvesting.

There are areas in Victoria where Bent Grass is the main constituent of the natural pasture herbage. It has not been sown, but it has encroached on ley land, and into areas where sown pastures have been allowed to deteriorate.

This natural spread of an introduced grass is significant. It manifests the fitness of the grass to the natural conditions of the region, but in the development, the immigrant plants and their diverse progeny are subject to natural selection. By elimination of the less suitable types a regional strain evolves with better adaptation to the environment.

The following notes written by Mr. F. Drake, B.Agr.Sc., Assistant Agrostologist, of this Department are repeated :—

"The Bent Grass family includes many species and varieties the classification of which is difficult. For the purpose of this article only common names will be used, and the discussion limited to those kinds which are available commercially and are in use for lawn planting. Under favourable conditions most of the bent grasses are aggressive and thoroughly permanent.

"The most satisfactory and reliable Bent Grass seed available commercially is New Zealand certified 'Brown top'. It is certified to be free of 'Red top,' a coarse grass.

"'Brown top' is a semi-tufted plant without surface creeping runners, but usually with some development of short rhizomes or underground shoots. Under mowing, it develops a very dense leafy sward. 'Brown top' is of an attractive, lightish green colour.

"'Brown top' seed comes principally from New Zealand. It is rapidly and deservedly becoming the standard grass for putting and bowling greens, and also for the better class of garden lawn. It has been shown that first-class lawns can be established from pure sowings of 'Brown top', the seed of which, although so very small germinates and establishes with remarkable vigour.

"A different kind of Bent Grass found in New Zealand and described as *Dryland Brown Top* is coming to be recognized as a valuable grass under Victorian conditions. This grass has well-developed rhizomes and is more able to survive dry conditions than is the ordinary 'Brown top'. It may burn off just as badly in hot weather, but the underground runners remain alive and will sprout again with the autumn rains. It is

Single plants of the Victorian bents in comparison with New Zealand brown top. Note the more vigorous growth and greater spread of the Victorian grasses (the three left hand rows).

Single plants of (left) Brown top and (right) Red top. Compare the dense multi-tillered habit of Brown top with the sparse development of foliage of Red top.

[Jnl. Board Greenkeeping Res.

a darker shade of green, sometimes appearing almost greyish, and has narrower leaves than the ordinary 'Brown top', but produces a turf of at least as great a density and equal in quality.

"A rather similar type of grass is to be found in many parts of Victoria around Woodend, Ballarat, and parts of Gippsland and where available is being used quite successfully for planting lawns and playing greens. In some cases it occurs naturally as the main constituent in certain country golf course fairways. It is a persistent and dense growing plant with vigorous rhizomes, and can be planted by digging up the plants, chopping them up, broadcasting the pieces and lightly covering them with soil.

"'Red top' is a very different plant from 'Brown top', although the seeds of the two species are remarkably similar. It makes a coarse and open turf. The seed comes chiefly from America where it is an important agricultural grass.

"It is wrong to call 'Red top', 'Creeping Bent' and such a description leads to confusion with the third type of Bent Grass to be described the true 'Creeping Bent'—this grass is characterized by having long surface creeping runners which spread over the surface of the ground and intermingle to produce a dense and leafy turf."

The above descriptions should clarify the relations of the different types of Bent Grasses about which there is much confusion—a confusion which is increased by the fact that many selections have been made and propagated vegetatively and sold under trade names.

For the purpose of this article we are concerned with Woodend Bent Grass—an ecotype or regional strain which has developed naturally, and has its nearest compeer in the *Dryland Brown Top* of New Zealand. Woodend and district farmers are interested in the proposition to harvest the seed of the local Bent Grass, and members of the Kyneton Agricultural Society are co-operating.

Kyneton farmers have laid the basis of a solid perennial rye grass seed industry, and the technique of harvesting and recleaning has been perfected by several contractors. With slight modifications, the same machinery may be used for harvesting and cleaning the Bent Grass seed.

The harvesting period is later than for rye grass and may be extended through February and March.

While refined methods are necessary to secure highest yields, "skimming" with the stripper will be the most practicable means of harvesting in most cases. A lot of roughage is collected, but preliminary cleaning by hand riddles may be done before cleaning is commenced.

The Bent Grass may be cut and thrashed. In this connexion it was noticed that stacks of Bent Grass hay, which were presented for inspection, had been cut on the early side and did not contain much seed, but the grass still standing in the winter had retained a considerable amount.

Modern machinery, harvesters with pick-up attachments, for example, are effective. They operate as header harvesters on the ripe standing crops, or the crop is cut first with the mower, allowed to dry in the swathe, and then gathered, and thrashed and partially cleaned in the one operation.

The seed is extremely fine—and yields are comparatively low, but prices are usually high. At present the retail price has reached 3s. 6d. per lb.

Probably farmers may expect yields of 50 lb. of seed per acre (equivalent to one-sixth of an ounce per square yard) and look to a return of 1s. 9d. per pound of cleaned seed.

Although the move to encourage the harvest of Woodend Bent Grass is in response to the appeal by the Department of Air, which will move many to make a special effort despite their present difficulties, it may be stated that opportunities for this new industry have existed for a long time. In the year ending 30th June, 1938, 12 tons of Bent Grass seed were imported into Victoria. The Department of Air wants 5 tons now. It is likely that even under peace conditions there would be a steady demand for that quantity in this State, and farmers and contractors should find an opportunity to add to their incomes.

Many graziers with surplus Bent grass should be willing to permit the harvesting of the seed on an acreage or a share basis.

The Australian Women's Land Army

The Australian Women's Land Army (A.W.L.A.) is playing an important and ever-growing part in the national war effort.

Any girl or woman between the ages of 18 and 50 may enrol for the A.W.L.A. Girls aged from 16 to 18 may be enrolled at the discretion of the Victorian Deputy Director-General of Manpower. The consent of parent or guardian is necessary, however, for all girls under the age of 21 years. Membership is confined to British subjects and friendly aliens.

A girl may apply for permanent full-time work or for auxiliary work.

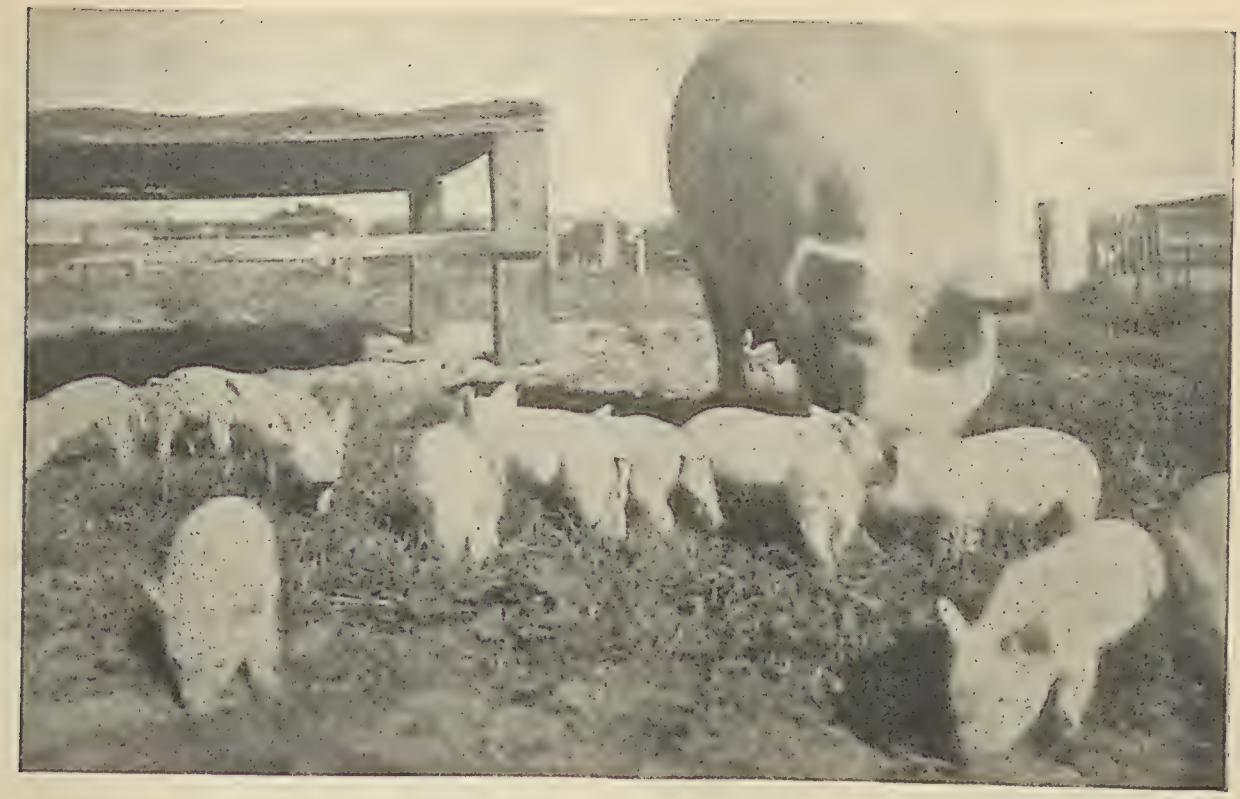
Full-time members enrol for continuous service for twelve months (with the option of renewal), or for the duration of the war, and agree to serve wherever they may be reasonably required. They receive dress uniform, working clothes and equipment, and a special rationing coupon allowance. Award rates of pay are allowed, and amenities such as insurance against illness and accident, holidays, fares to places of employment, carefully controlled accomodation, recreation, &c., are provided.

After twelve months' continuous service members are, subject to good conduct, entitled to twelve days' annual holiday on pay, with fares to and from home. Holidays without pay may be granted at other times. Other holidays are permissible at the discretion of the employer. A member may obtain up to twelve days sick leave per annum, on medical or other evidence acceptable to the Deputy Director-General of Manpower. Facilities for training under competent tuition, particularly for special jobs such as herd testing, are available and provision is made for promotion.

On dairy farms fine work is being done by land army girls in all grades of work. On many farms the girls are doing the ploughing, harvesting, and stacking, and in seasonal jobs auxiliary girls are fruit picking, vegetable growing, pruning, flax sorting. They are also doing good work in packing sheds and canning factories.

From all parts of the State employers are expressing keen appreciation of the good work the land army girls are doing, and they are retaining many of the seasonal recruits for permanent work. Despite the great response of Australian women, however, the need for more and more recruits is becoming more urgent as the demand on manpower increases.

Of particular interest to country people is the fact that the Manpower Directorate is obtaining substantial help from local community bodies. This co-operation is particularly welcome to the Directorate, and anyone desirous of assisting in this recruiting movement, should address their enquiries to the Australian Women's Land Army Headquarters, 105 Swanston-street, Melbourne, or to the nearest National Service Office.



PIG PRODUCTION SURVEY

Summary and Report

By L. A. DOWNEY, H.D.A., Pig Expert

DURING May, 1943, a survey of the pig industry of Victoria was made to obtain information on production and factors influencing same.

The information was obtained by twenty Stock Inspectors of the Department of Agriculture personally submitting a set of prepared questions to a number of pig keepers in their districts.

Three hundred and seventy-nine (379) pig keepers in all parts of Victoria supplied the information, which covers all classes of pig raising.

Table 1 shows that few of the farmers reporting have relatively large numbers of pigs, the majority being small producers. Of the 39 who had over 100 pigs, 17 fed their pigs principally on refuse from butter factories, hotels, cafes, or defence force camps.

Information prepared a few years ago by the Victorian Government Statist showed that the proportion of small pig keepers in Victoria was even greater than is shown in this survey. Therefore, the farms included in the survey cannot be regarded as an average of the farms of Victoria where pigs are kept, because they include too great a proportion of those with large numbers of pigs. Nevertheless, the volume of information secured serves the purpose for which it was obtained, and provides a check on the opinions based on observations of those who attempt to guide the pig industry.

TABLE 1.—GROUPING 379 FARMS ACCORDING TO NUMBER OF PIGS.

71 farms had	10 pigs or less
87 farms had	11 to 20 pigs
135 farms had	21 to 50 pigs
47 farms had	51 to 100 pigs
39 farms had	Over 100 pigs

Reports were obtained on the number of brood sows kept in May, 1943, and in May, 1942.

Table 2 shows that there was a total increase of 193 sows, or 7·1 per cent. during that period. There was an increase of 6·1 per cent. in the number of farms keeping brood sows, which accounted for most of the total increase in brood sows. The average number of sows kept per farm that had sows increased from 8·2 per cent. to 8·6 per cent. during the twelve months.

TABLE 2.—NUMBERS OF BROOD SOWS KEPT.

—	May, 1943.	May, 1942.
Number of farms keeping brood sows	347	327
Total number of brood sows ..	2,988	2,695
Average number of brood sows per farm keeping sows ..	8·6	8·2

Table 3 shows that pigs other than brood sows were 8·8 per cent. fewer on the 379 farms in May, 1943, than in May, 1942.

TABLE 3.—NUMBERS OF PIGS OTHER THAN BROOD SOWS.

—	May, 1943.	May, 1942.
Number of farms with pigs other than brood sows	370	352
Total number of pigs other than brood sows	18,908	20,734
Average number per farm ..	51·1	58·8

One hundred and eighteen farmers reported their intention of increasing their numbers of brood sows, 43 reported their intention of decreasing the number, while the others had no immediate intention of changing.

From the reports of proposed changes, a net increase of 374 brood sows, or 12·5 per cent. was indicated.

Food Supplies

On the subject of pig feeding, it was ascertained that of the 350 pig keepers using cereal grains or meals, 206 used 10 bags or less per month, 82 used 11 to 20 bags per month, while 62 used more than 20 bags per month.

Of 296 pig keepers reporting on the procurement of their cereal grains and meals, 252 purchased from their local stores, 9 from city stores, 33 from the Wheat Board or Barley Board, while 92 grew their own.

Pig keepers were asked the cost of their purchased cereal grains and meals landed at their farms. Some of the replies, however related to prices at stores, while others related to delivery at pig farms. Costs at both places are grouped together in Table 4.

Comment

Farmers commenting on factors influencing pig production reported that production was being restricted in 51 cases by shortage of labour, in 22 cases by the uncertainty and irregularity of supplies of cereal grains and meals, in 10 cases by transport restrictions, and in 4 cases by the shortage of building and fencing materials.

Several important economic factors affecting future supplies of pig meats are brought to light in the survey, and action in the provision of cereal grain and meals to pig feeders at costs lower than those ruling now is shown to be an urgent necessity in view of the

TABLE 4.—FOOD COSTS.

—	Barley.										Wheat.										Pollard.					
	Whole.					Crushed.					Whole.					Crushed.					Prices for 2,000 lb. Ton.					
	Prices for 50 lb. Bushels.										Prices for 60 lb. Bushels.															
	2s. to 2s. 6d.	2s. 7d. to 3s.	3s. 1d. to 3s. 6d.	3s. 7d. to 4s.	4s. 1d. to 4s. 6d.	2s. 7d. to 3s.	3s. 1d. to 3s. 6d.	3s. 7d. to 4s.	4s. 1d. to 4s. 6d.	4s. 7d. to 5s.	3s. to 3s. 6d.	3s. 7d. to 4s.	4s. 1d. to 4s. 6d.	4s. 7d. to 5s.	3s. to 3s. 6d.	3s. 7d. to 4s.	4s. 1d to 4s. 6d.	4s. 7d. to 5s.	5s. 1d. to 5s. 6d.	5s. 7d. to 6s.	£6 to £6 7s.	£6 11s. to £7.	£7 1s. to £7 10s.	£7 11s. to £8.	£8 1s. to £9.	£9 1s. to £10.
Number of cases reported ..	2	32	40	14	1	3	20	15	15	4	5	38	11	1	2	4	9	18	14	2	14	24	40	5	6	7

intentions of the Commonwealth Government to fix pig prices at levels below those ruling over the past twelve months, and at the same time to stimulate pig production.

The survey showed a decrease of 8·8 per cent. in the number of pigs other than brood sows at May, 1943, as compared with May, 1942, and an increase of only 7·1 per cent. in the number of brood sows over the same period. There should be a corresponding increase in the number of pigs coming forward for slaughter in the year 1943–44.

The increase in brood sows is small considering that it was about 30 per cent. lower in 1942 than in 1941.

It was the stated intention of growers in May, 1943, to increase their brood sows by 12·1 per cent. At that time, and for the previous twelve months, pig prices were very favourable to producers, and their intention to increase breeding may be affected by later events.

Pig raisers as individuals are small producers in the main, and are small users of cereal foods for pigs. 58 per cent. reported using ten bags or less per month. 85 per cent. of those using cereal foods purchased their requirements from local stores.

Costs of cereal grains and meals to pig raisers vary by 2s. per bushel for similar foods, and in the majority of cases the costs are too high in relation to basic prices as quoted by the Barley Board, the Wheat Board, and, in the case of pollard, by flour millers.

The costs of these cereal foods also are too high in the majority of cases reported in relation to those which pig raisers can afford to pay when their pigs are sold at prices fixed under the Commonwealth Pig Meat Control Plan, and for that reason, unless these cereal costs can be lowered, production will be reduced when the plan operates.

It is estimated that under the price schedule of the Pig Meat Control Plan, pig raisers will be able to afford 3s. 4d. per bushel for crushed barley, and 4s. per bushel for crushed wheat delivered to their piggery. At present rates quoted by the Barley Board and the Wheat Board, it should be possible for most pig raisers to keep below these prices, but more than half of the pig raisers are paying considerably more because of the high margin for retailing and distributing the grain. Charges are particularly high on crushed wheat and barley.

It is estimated that 9d. per bushel on barley, and 11d. per bushel on wheat represents 1d. per lb. in the cost of producing pigs. There are in the same districts many examples of price variations of more than 9d. and 11d. per bushel on these grains.

Pig raisers have been made aware during the past year or two that they were permitted to purchase directly from the Barley and Wheat Boards, but it is obvious that a very small percentage of them are able to do so either individually or collectively.

The Barley Board advises now that it is unable to offer services previously available to encourage pig growers to buy direct from the Board, as it can only supply in 16-ton trucks from Serviceton, and it cannot guarantee to cover trucks with tarpaulins. Further, because of its limited period of control of barley, the Board's State Supervisor says he is not disposed towards making any further arrangements to handle small lots of barley.

Co-operative butter companies handle grains for pig raisers in their districts, but their prices in most cases are much higher than would appear necessary. In one case a co-operative butter company was supplying at its store whole barley at 2s. $10\frac{3}{4}$d. per bushel, while its price for crushed barley was 4s. per bushel, and for barley meal 4s. 2d. per bushel. This company was purchasing the whole and crushed barley from a Melbourne merchant.

A clean pasture run is ideal for pigs.

In the absence of better facilities for pig raisers to procure smaller lots of wheat and barley direct from the Boards, control of retail prices of wheat and barley, both whole grain and crushed, and of pollard is most desirable. In this connexion the Department of Agriculture already has taken steps to bring under the notice of the Commonwealth Food Controller the necessity for control of retail prices of fodder with a view to action being taken by the Prices Commissioner.

It should be realized that in Victoria the majority of pigs are raised on dairy farms where wheat and barley are not grown, and when the relationship of grain prices to pig prices is unfavourable, dairying pig raisers reduce their pig production to a stage where milk by-products form almost the entire diet of pigs. When grain is used to the maximum extent with a minimum of separated milk, pork production is about 15 cwt. per ton of butterfat, but when the minimum of grain and maximum of milk are used, pork production is about 4 cwt. per ton of butterfat.

As the pig industry is established almost entirely on dairy farms, it is comparatively easy to maintain production by providing grain at prices in favourable relation to pig prices.

Stabilized pig prices would, in normal times, encourage pig production on grain growing farms even though the prices were too low to stimulate production on dairy farms, and as a long term policy this is sound, and even under present conditions of a stable price for wheat, and shortages of labour, building materials and transport, wheat and barley growers should be attracted to pig production. However, pigs from these sources comprise only about 10 per cent. of Victoria's production.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Pietsch, R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark," Nhill	Spiers, Albert	Bamawin Extension
Ellwood, A. H. ..	Paschendaele	State Experiment Farm ..	Rutherglen
Fairchild and Clutterbuck	Tinamba	Sutherland, R. N. ..	Nullawill
Geddes, L. D.	Bungaree	Trenery and Soderlund ..	"Promview," Foster
Hamblin, A. T., & Sons..	Toolleen	Trigg, A. J.	Bungaree
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
		Tweddle, J. T.	"Winlaton," Shepparton
Hawtin, I. E. and F. ..	"Rossmoyne," Colac	Walch, M. U.	Baring
Haywood, Dr. A. R. ..	Hastings		

Soil Drift Control

Results of Competition, 1942-43

Report of the Judge—
H. HANSLOW, Commissioner,
State Rivers and Water Supply
Commission

A Mallee dust storm approaching Mildura.

FEW realize that if the continual drifting of the soils of the Mallee country is not halted the tragedy of the American Dust Bowl may be repeated in Victoria. The ever recurring work and expenditure of cleaning drift soil from the irrigation channels of the Mallee districts has done more than anything else to bring this problem under the notice of the State Rivers and Water Supply Commission.

It had been noticed that even in very "drifty" country there were some farmers who had much less soil drift than their neighbours. The Commission thought that a Soil Drift Control Competition would serve to provide a comparison between the methods adopted by these farmers and those on whose farms drift was more pronounced. It was considered that the results would be of great help to farmers who could learn by the successes and failures of the competitors much more quickly than by their own individual experience. The first of these competitions was inaugurated in 1940–41.

Last season there were five district competitions and a Mallee Championship. The district competitions were for the following Shires:—(1) Mildura, (2) Walpeup, (3) Swan Hill, (4) Dimboola, (5) Birchip, Wycheproof, and Karkarooc. The prize money for each of the Shire competitions was apportioned as follows:—First £15, Second £6. The winner of the Championship received a prize of £10 and will hold the Hanslow Cup for one year. At the end of that period he will receive a replica of the Cup.

The prize money was subscribed by the following organizations:—Messrs. H. V. McKay, Massey Harris Pty. Ltd.; International Harvester Co. Pty. Ltd.; the State Savings Bank of Victoria; Melbourne and Geelong Woolbrokers Association; Messrs. Kimpton and Son; Thomas and Sons; and Noske Bros.

Conditions of the competition provide for the award of a prize to the farmer who, in the opinion of the judge, is making the best effort to control soil drift. Due allowance is made for the degree of difficulty encountered by each competitor in the country worked by him.

One judging was made this year and in the course of his inspections the judge travelled 1,400 miles of Mallee roads, inspected 33 competing farms containing 54,000 acres, and a number of others which were of interest.

Many of the entrants are making an excellent effort under difficult conditions. It was not an easy matter to judge between them, and it is still more difficult to put into words impressions of the work done and a description of the methods used by many of the competitors.

When a physician is called to a patient he first looks for symptoms to aid him in his diagnosis of the ailment, then for the cause. By controlling the cause he can prevent the spread of the disease.

Our attitude to the Mallee should be much the same. We know it to be suffering from that serious condition—wind erosion. The symptoms are very evident—miles of impassable roads, of buried fences, hills blown down to the sub-surface limestone, drift soil on the railway lines.

The cause is not so obvious however. Some farmers say they get more wind now than they used to do, but meteorological observations do not support this contention.

There is however less shelter from the winds than in the earlier days of settlement and this may be responsible for the belief. It is stated also that soils drift more readily nowadays. The evidence points that way, it is true, and possible reasons may be found in a review of Mallee settlement from the days when wind erosion was practically unknown to the present day.

The Mallee country had been covered with the well known Mallee scrub for many hundreds of years. These trees were deep rooted and had been drawing mineral to the surface from the sub-soil. The leaves, twigs and bark falling from them enriched the surface soil. Everything that was drawn from the soil went back into it.

When the settlers came the scrub was rolled and burnt. In that first burning organic matter and humus that had taken many years to form were destroyed. Crops were grown, and the grain containing minerals drawn from the soil was shipped away. To aid in the destruction of shoots from the scrub and to make cultivation easier, the stubbles were burnt each season. Sheep were fed on the property and the minerals they absorbed were also shipped away in wool and lambs. In return the land received about 50 lb. of superphosphate per acre with the wheat crops sown.

The Wimmera lands had shown that wheat could be grown successfully by the frequent working of bare fallow, cropping, burning the stubble and fallowing again, and the same system was tried in the Mallee. But when Mallee soils were subjected to the practice of these methods it was found that they were much more liable to erosion.

It would seem that one way to retard drift would be to get humus back into the soil. This is assisted by ploughing the stubble back into the ground.

In America to-day new types of machines are being used to cultivate heavy stubbles. The burning of stubble is no longer practised by progressive farmers in that country.

Drifting sand forced the removal of a farm house from this site.

Some Mallee farmers are afraid of diseases such as "Take All" getting into the wheat if they do not burn. In this connexion the view of one of the competitors, Mr. F. J. Hofmaier, of Rosebery, is interesting. Mr. Hofmaier has never burnt a stubble since 1920. He harvested 10,500 bags of wheat from 1,000 acres, in 1941–42 and had a 9 bag per acre average from 400 acres in 1942–43. This competitor says the "disease" he most fears is soil drift, and he prefers to leave his stubble unburnt. If he leaves a paddock out to grass he will take a crop of oats from it before

fallowing so as to have stubble to work into the land. Bencubbin wheat is preferred by Mr. Hofmaier because of the greater amount of stubble left to plough in.

The number of paddocks with heavy wheat stubbles sown with oats this year was remarkable. Stubbles too heavy to sow by ordinary methods were either sown broadcast or through the combine, with the float raised, and covered with a twin disc. The tractor-drawn disc was found to be effective for this work.

Sandhill blown down to the limestone. The stump indicates the depth of soil removed

One competitor had sown over 200 acres to rye corn which was all up at the time of inspection and the biggest patch of green feed seen during the tour. Every competitor held the opinion that grass or as much stubble as possible should be ploughed into the soil when fallowing. There were some however who advocated burning stubble as preferable when sowing oats or barley after the wheat crop has been taken off. When questioned as to their reasons for favouring this method the following were given :—

1. When the stubble is burnt, the ground is much easier to work.
2. A better strike is obtained and a better crop results.
3. The ash ploughed in helps the soil.

Most of these growers replied that burnt stubble land was much easier to work and that if everything went alright, the following crop might be better. In the Mallee however, things do not always go right. Frequently the greater part of the ash is blown away before it can be worked into the soil. Furthermore burnt stubble land worked up with the combine is usually extremely fine. A spell

Subsoil showing in cultivated ground. The soil from this paddock is being blown away rapidly.

Left—Drift-soil caught in trees at Kooloonong. Right—Where the soil came from.

of dry weather, followed by a heavy wind before the oats strike will mean that much good soil will be blown away, or if the oats should strike and the season be dry scarcity of feed may force the farmer to put sheep on the oats and so remove the protection and lose the soil.

If oats are disced in on stubble and a bad season follows the stubble will still be there for feed and to hold the ground together. In an average year the oats will provide good feed. In a better season it may not be needed for grazing and can be stripped or cut for hay.

Competitors were unanimous as to the advantage of working the land while wet, as this seems to "pug" the soil. Such fallow should be left undisturbed unless it becomes weedy, when it should be "sheeped" off. The land should be worked only if the sheep cannot clean it, care being taken to leave it rough.

In one district visited there was heavy rain in December. Two farms were inspected where the owners had neglected to take advantage of the wet conditions and work fallow that was likely to drift. The state of their land showed how dearly they were paying for this neglect.

During the inspection of a neighbouring farm heavy wind was blowing and the fallow, which contained a lot of straw, was holding well. The neighbour's fallow however was drifting and a closer inspection showed that, although it contained much straw the trouble had been caused by neglect to work the fallow after the rain.

Another farm with a big hill having a south-east exposure was inspected. The owner who was an enthusiastic advocate of drift prevention told the judge that during the winter time he had "busted up" the bare places on the hill and had carted stable manure on to them. A strong south-east wind was blowing when the inspection was made and the soil was drifting badly. The worked soil was being carried over the hill leaving a large portion of the land with the plough sole exposed. The blown patches where the manure had been spread had caught a quantity of drift. The soil had drifted over the hill for a considerable distance, had piled up for over a chain in the neighbour's stubble and covered several wires in the division fence. This was a big loss. The work of fallowing had been wasted, the production value of the land reduced for many years, if not for ever, and a fence had to be raised.

Can we learn anything from this farmer's misfortune?

An examination of the fallow indicated that there was not enough straw in it to hold. Secondly, when rain fell in December the farmer did not work his fallow because he was busy harvesting. In the writer's opinion it would have been better to have left the crop for a few days and worked up the ground while still wet. This farmer had both tractor and horses and much ground could have been covered in a few days.

The farmer was discouraged and said he would not enter the competition again, but it was explained to him that all are subject to occasional misfortune and much can be learned from it. He has a job in front of him to restore that land, and should he succeed, his example would be of great encouragement to others in similar circumstances.

Another of the outstanding competitors had the misfortune to lose a considerable quantity of soil during the year. On this farm two years ago the judges of the Competition had a discussion regarding the degree of difficulty

encountered by the competitor, and it was agreed that the land was of a type which would not drift very readily, but this year it had drifted badly. It appears that last year a five bag crop of wheat was taken off. The land was ploughed with a mouldboard plough and all the straw ploughed in. Weeds came thick on the fallow in the spring, and as there were not enough sheep to clean it thoroughly the paddock was harrowed. During the summer there were several bad thunderstorms followed by wind. The paddock drifted badly. Owing to the shortage of labour the farmer was unable to do anything to stop it.

The writer is of opinion that the trouble was caused by use of the harrows, which left the ground too fine. If a Wimmera or scattered-tyne scarifier had been used it would have mixed the straw well into the soil and brought the lumps to the top, leaving the ground rough and less likely to drift.

Last year one of the competitors pointed out where the soil from a paddock had drifted through a fence and had been caught in the stubble. The strip of drift soil was half a mile long and a chain wide and two feet deep along the fence. This year the competitor had fallowed the paddock and then harrowed the drift, thinking that the drift soil would spread over the fallow. The result was not as he expected however. The soil drifted, but some two chains out it took the soil from the paddock leaving a strip bare of soil two chains wide. The farmer put a number of deep furrows through the bare strip and trapped more of the drift, but to his surprise the land on the far side of the furrows also drifted, exposing a strip about half a chain wide for him to furrow again to prevent further drift. These happenings show how careful a Mallee farmer must be if he is to hold his soil.

Some farmers have been heard to say that they work their hills so that they will blow over the flats, but experiences such as this indicate the risks of such a practice which might quite easily result in the loss of both hill and flat.

The Mallee sand hills are a most difficult problem; the higher and the narrower the top the more difficult it is to hold the soil. In the course of inspections some hills blasted beyond hope of restoration were seen. One hill, which was noticed to be drifting badly two years ago, had this year completely lost all soil and was stripped down to the limestone. When other areas rapidly approaching this condition are to be seen on all sides, the mind of even the most unthinking person must experience twinges of anxiety for the future of the Victorian Mallee.

The problem of holding the soil on Mallee hills was exhaustively discussed. The outcome of such discussion leads the writer to believe firstly, that to leave the top of a hill uncleared of Mallee scrub served as a sand trap which in time would bury the trees.

It was dangerous also to leave a few trees on the hill because stock seeking shade under them would loosen the soil and cause scouring.

Further, a hill left too long in grass will start to scour, and if not quickly stopped the scours will soon become large and hard to cure. When they start, scours can be temporarily stopped with branches, rubbish of any sort, or "busted up" at right angles with a plough.

Scours are a sign that the hill should be cropped.

Mr. G. S. Staples of Rainbow, the winner of the Karkarooc–Birchip competition never fallows the top of a sand hill or any place likely to drift. He crops these places and leaves the stubbles, with the result that the

This block was cleared in 1921, and has since been fallowed five times. The depth of soil lost is shown.

Erosion on a sandy slope restricted by lucerne.

soil is holding well. Light land under fallow is vulnerable, but on an exposed sand hill is doubly so.

Mr. C. Hatcher, near Hopetoun, is growing lucerne on some of his hills with good results.

Mr. A. Bodey of Beulah has 38 acres under lucerne. The average rainfall there is 14½ inches, but the results are most encouraging. Mr. Bodey works his lucerne in the autumn and sows oats in it, then grazes or cuts it for hay. To have a crop of lucerne on a farm to provide green feed when all other feed is dry, is an asset.

Lucerne is worth a trial under Mallee conditions, even for holding badly blown sand hills. It is a hardy plant under dry conditions and provided favorable conditions exist for establishment and early growth, the deep roots of lucerne penetrate rapidly, and the older plant exhibits great tenacity. Two lb. per acre is a sufficient rate for seeding. Autumn is the best time for sowing, and although in a good season the lucerne may be established even on stubble, it is desirable to prepare the ground for sowing.

On badly blown hills it will be necessary to level off the bumps. If left, scour will develop around the bumps, and these scours will open up into wind chutes. The hill should then be worked-up, and sown to rye corn. In places where the sub-soil is exposed it should be "busted up" very deeply and roughly to catch the drift.

In last year's report there was reference to a hill that had been ploughed deeply with an eight furrow mould-board plough stripped of all but the back and front mould-boards. The deep furrows caught much drift and the area this season produced four bags of wheat to the acre.

Experience has taught that once a hill has been "brought back" it should never be fallowed again, nor left in grass too long without being sown down to a cereal.

Mr. T. A. Clugston has attacked the sand-hill problem by ploughing the soil about five inches deep while wet, and keeping weeds down with sheep.

There was a rough wind blowing while judging was taking place and the soil was holding well.

Mr. A. E. Barbary of Woomelang showed a 200 acre paddock with an interesting history. In the 1938 drought it was in fallow and sown to wheat, yielding two bags per acre. In 1939 it was self sown and eaten off. It was drifting badly in 1940–41 and was deeply furrowed with furrows one chain apart at right angles to the wind. In 1941–42 it was drifting again and was furrowed between the old furrows. In 1942 the drift that had been caught was "combined", and sown with Bencubbin and Baldmin wheats, yielding eight bags to the acre.

Mr. T. Parker of Karween, Millewa, had done a similar work with good results.

The number of farmers who have ceased to fallow near the house and dams was noticeable. The places had been cropped but not fallowed. Mr. T. Parker had drilled oats and rye corn on all lands about his dwelling. A number of the competitors had nice plantations and gardens around their homes watered from dams. These plantations and gardens provide much comfort for their owners, but it is surprising the number of Mallee homes with little or no provision for shelter.

No stock should be allowed within two or three chains of a dwelling. This area should be fenced off and planted with suitable trees and shrubs. Mr. Kelly and Mr. Callahan of Millewa have shown what can be done with Mallee wattles and hop bush.

Shelter is necessary to the stock also, and plantations of trees of one half to one acre are valuable. Plantations near dams are advisable in that the stock can get both shade and water without having to travel long distances.

Mr. Kelly of Lake Boga has a pepper tree large enough to shelter three or four hundred sheep close to his dam. The pepper tree does well in Mallee soils if watered occasionally.

Mr. Pole of Torrita, has a "clump" of pepper trees planted near the dam, a valuable mid-day camp for horses when he is cropping. A few of these trees planted on either side of the channel into the dam would grow quickly with the aid of soakage but would need protection when young from stock and rabbits.

In the course of judging last year it was noticed that a heavy drift was coming from fallow across the road. On examination it was found that the subsoil was exposed in many places. The opportunity was taken this year to examine the stubble on this land. Where the soil had not blown away the straw looked as though an eight-bag crop had been harvested but the bare places, if they could have been lumped together, would have grown about as many bushels per acre.

One of the best features of the Mallee lands is that they are so easy to cultivate, but if the present rate of drift continues from many of the farms this will soon be a thing of the past. Much of this land is turning into what the Americans call "ten minute land". You have just ten minutes to work this land after rain and then you will have to wait until it rains again.

Of the thirty-three farms in the competition eighteen were worked with horses, eleven with tractors and four with horses and tractors. The tractor has many advantages and all tractor men declare they do not want to go back to the horses, but a note of warning in this regard should be sounded. A tractor-drawn disc plough, if travelling too fast will throw the sods a long way and break them to pieces. This increases the tendency to drift.

The judge is of opinion that the system of leasing land on a short term lease is detrimental to the land, and also is one of the greatest causes of erosion. The lessee's only interest is to get as much out of the land as he can at the least expense. Should much of the fallow blow away it is not his concern. He can lease more land elsewhere. But if the owners do not soon devise some better system of renting, the land will become a liability on which rates and taxes must still be paid.

The winner of the Cup is Mr. F. A. Meagher of Murrayville. This competitor also won the 1940–41 competition and on that account was debarred from entering last year. The writer had the pleasure of examining his farm in July last, and the vegetative cover at that time was excellent. Mr. Meagher had sown nearly all his grass land with barley and some oats. Rye corn had been planted on the hills.

Mr. Meagher claimed that he could make more out of barley as green feed than any other way. There was a good growth of barrel clover and trefoil encouraged by not cropping too often, judicious grazing, and the liberal use of superphosphate.

At the inspection in April all paddocks on Mr. Meagher's farm showed an abundance of feed, both green and dry. The property was well stocked. The ewes were just starting to lamb and looked well. Ample stocks of hay, and more than 600 bags of barley, oats, and wheat as well as seed wheat were on hand. The fallows were looking well and not drifting. On these 4,777 acres there was little evidence of drift. Last year 580 acres of fallow were cropped for a seven bag to the acre average yield. One paddock of 220 acres yielded 27 bushels per acre, and was second in the Pinnaroo competition.

The competitor's reply to the question, "What efforts are being made to prevent drift?" was "Lengthy rotations, no stubble burning, sowing stubble to cereals for grazing; judicious management of sheep; the prevention of close grazing on paddocks likely to drift; reducing number of stock carried in summer months; building up stocks when season is assured; liberal use of superphosphate when available, thus building up soil fertility which tends to minimize drift".

The tenacity of lucerne on scoured sandy soil is clearly indicated.

Left—A water channel obstructed with drift sand from the paddock at right.

Although there is not a second prize in this Competition Mr. V. L. Watson, of Nyah West, must be complimented for his excellent effort.

The keenness of the competitors in their efforts to solve this serious Mallee problem of soil drift, considerably lightened the work of the judge. The Commission is deeply appreciative of their efforts, which not only benefit themselves, but are of lasting value to the Mallee country generally. Thanks also are due to the donors of the prize money for their practical interest in the problems of soil drift control.

The rules of the competition provide that the winner of the Cup cannot compete the following year, and the winners of a Shire Competition cannot compete for the Shire prize the following year, but may compete for the Cup.

The winners of the Shire prizes are as follow :—

Swan Hill Shire.
1st .. Sinclair, A. J. M., Swan Hill.
2nd .. Pearce, A., Nyah West.
*3rd .. Waldron, A. G., Kooloonong

Mildura Shire.
1st .. Parker, T., Karween.
2nd .. Callahan, F. S., Karawinna.

Karkarooc, Wycheproof, and Birchip Shires.
1st .. Barbary, A., Woomelang.
2nd .. McManus, W., Sea Lake.

Walpeup Shire.
1st .. Meagher, F. A., Carina.
2nd .. Mickan, J. G., Murrayville.

Dimboola Shire.
1st .. Staples, G. S., Rainbow.
2nd .. Clugston, G. A., Warracknabeal.

* Where there are ten or more competitors a third prize of £3 may be granted.

The Young Calf

It is advisable to take the newly born calf away from the mother as soon as possible, provided it has had at least one feed of the mother's milk (colostrum), which is necessary to help commence the proper functioning of the digestive organs. If the calf is left with its mother for several days the cow becomes unduly upset, adding further to the risk of her developing udder trouble.

If the calf is allowed to become hungry by withholding feed for 24 hours bucket feeding will be simplified. First place a finger in its mouth and, when sucking commences, slowly withdraw the finger; in this way the calf soon learns to drink without assistance.

It is very important that all feeding utensils be clean and sterile before use.

For the first two weeks 1 lb. of fresh milk should be fed for each 10 lb. of the calf's live weight. Skim milk or gruel may then be supplemented, until at the age of approximately ten weeks it should continue to thrive on gruel alone.

Gruel consisting of three parts pollard and one part linseed meal has proved satisfactory. Linseed meal alone tends to scour the calves.

Dry feed in the form of chaff, to which a little crushed grain is added will prove most beneficial for the older calves.

All calves should have access to a clean grazing paddock during the daytime.

[Contributed by the Live Stock Division.]

REARING CHICKENS *on the* COLONY SYSTEM

By W. O. PEDERICK,
Assistant Poultry Expert

The colony system in operation at the State Research Farm, Werribee.

THE value of colony houses for rearing chickens is not fully realized by many poultry keepers and it is probable that if they were better understood, they would be more extensively used.

It is necessary to supply chickens with liberal quantities of good food to ensure that they will develop into profitable stock, but they must also have hygienic conditions and environment for rapid growth and development. Higher egg production from the pullets and better prices for the cockerels will result.

Chickens reared on the colony system thrive much better than those enclosed in small bare yards; the ground is cleaner and the chicks have greater opportunities of finding natural food, such as insects, seeds, and a variety of green feed.

The colony system is most economical in regard to labour, food, and the construction of the houses. Further, on most poultry farms accommodation for poultry becomes short towards the end of the chicken season. It is usually difficult to find room for the young growing stock without over-crowding the layers. If young stock are reared in colony houses the layers will remain undisturbed until the end of the laying season when the older birds and culls are marketed. The space thus provided is available for the most forward pullets from the colony houses.

Many types of colony houses are used with success. Some are portable and others are permanently placed in the rearing grounds. The portable type as used at the State Research Farm, Werribee for many years is both effective and simple in construction. The dimensions are 6 feet long by 5 feet wide by 4 feet high, built tent shape to protect it against severe winds. A house of this size will accommodate 50 chickens, 8 to 10 weeks old, for about 8 weeks, when the number should be thinned down by removal of the most forward pullets to their permanent laying sheds.

A wire-netting floor should be provided by stretching 1½-in. mesh netting over a frame of 3 inches by 1 inch battens on edge; this frame should fit neatly inside the bottom of the house. The netting floor will keep the chickens off the damp ground and away from their own droppings; it also prevents loss from smothering.

Every poultry keeper knows the risk of shifting growing chickens to new quarters. Great loss is experienced at times by smothering, as the chickens often sleep on the floor and crowd one on top of the other. The netting floor raised several inches off the ground allows the chickens underneath to obtain sufficient air.

Portable colony house for rearing chickens on free range.

10 feet long and 3 feet high covered with wire netting will be enough for one house.

The houses should not be moved far at one time, otherwise there is a danger of the birds refusing to go to the house in its new position, and they may camp on the ground where the house last stood.

Pullets should be transferred from the colony houses to the laying sheds when they are about 4 to 5 months old.

A colony house with nests attached may also be used for a breeding pen on free range.

Portable colony houses are recommended particularly for use on the farm or orchard. By shifting them between the trees a few feet every four or five days, the ground will be well manured, the birds will be greatly benefited by the shade of the trees, and in their foraging they will rid the orchard of many destructive insects. Several houses can be used in the same orchard or paddock, if placed 50 to 60 feet apart. Movable hurdles are used to make a small enclosure round the house. In a few days the birds will become accustomed to their own particular house, and the hurdles may be taken away and used elsewhere.

Even though the young birds from the various houses mingle during the day, especially at feeding time, they will return to their respective houses at roosting time.

When transferring chickens from the brooder house to the colony house, do so in the afternoon after they have been fed. The chickens should be put into the colony house, the door closed and the hurdles placed in position round the house. They should be confined to the house until about mid-day of the following day when the door can be opened and feed and water supplied. At night time they will usually go into the house without any trouble, but it is advisable to watch them for the first few nights, and if necessary, shut them in.

After four or five days the hurdles may either be removed and used for another house, or opened a little to let the birds out, but left around the house to protect it from farm animals. Five hurdles made of 2 inches by 1 inch hardwood,

Materials for the House

The material required for the construction of the house and hurdles described is as follows :—

For the house—

- Two pieces of 3 x 1 hardwood, 7 ft. 2 in. for the bottom.
- Two pieces of 3 x 1 hardwood, 4 ft. 10 in. for the bottom.
- One piece of 2 x 1 hardwood, 5 ft. for the bottom.
- Six pieces of 2 x 1 hardwood, 4 ft. for sides.
- One piece of 2 x 1 hardwood, 8 ft. for ridge.
- Two pieces of 2 x 1 hardwood, 3 ft. for perches to rest on.
- One piece of 2 x 1 hardwood, 3 ft. 4 in. to hinge nest lid to.
- One piece of 2 x 1 hardwood, 1 ft. 4 in. for ventilator at back.
- Two pieces of 2 x 1 hardwood, 1 ft. 3 in. for door frame.
- Two pieces of 2 x 1 hardwood, 5 ft. 10 in. for perches.
- One door, 1 ft. square.
- Six pieces No. 14 gauge wire, 8 ft. 6 in., to support ruberoid.
- Two pieces No. 2 ply ruberoid, 8 ft. 4 in. for roof.
- If ruberoid is not available, iron, cement sheets, or bags painted with tar or cement wash may be used.

For front—

- One kerosene tin flattened out and cut in half—half to coven in each side of door.
- One pair of 1½-in. butt hinges.
- One piece of wire netting, triangle shaped (3 ft. at base, 2 ft. to peak).

For back—

- One and a half kerosene tins flattened out—one above the nest boxes and a quarter on each side of them.
- One piece of tin, 3 ft. 3 in. x 1 ft. 3 in. (cover for nests).
- One pair butt hinges, 1½-in. for cover.
- One piece of wire netting for ventilator, 1 ft. at base, 8 in. to peak.
- Four kerosene tins for nests.
- One kerosene tin for water.
- One kerosene tin for shell grit and charcoal.

For floor frame—

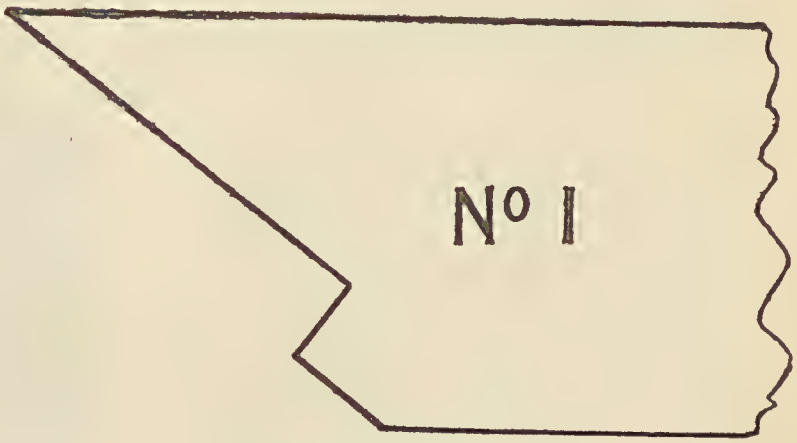
Two pieces 3 x 1 hardwood, 5 ft. 7 in.
Four pieces 3 x 1 hardwood, 4 ft. 7 in.
One piece wire netting, 5 ft. 7 in. x 4 ft. 7 in., 1½-in. mesh.

For hurdles—

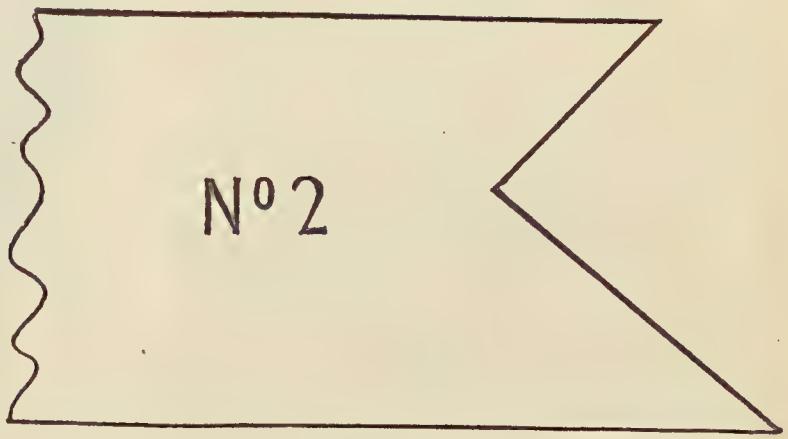
Two pieces 2 x 1 hardwood, 10 ft., top and bottom rails.
Two pieces 2 x 1 hardwood, 3 ft. 10 in., for ends.
One piece 2 x 1 hardwood, 3 ft. 4 in., for centre stay.
Piece of wire netting, 10 ft. x 3 ft.
To makes loops of hoop-iron, cut pieces 11½ in. long, lap 1 in., and rivet.

How to Build the House

Scarf out sufficient at the end of each of the 7-ft. 2-in. pieces of timber to take a 2-in. x 1-in. batten; lay the two 7-ft. 2-in. pieces 4 ft. 10 in. apart with the scarfed edges up, and nail on the 5-ft. 2-in. x 1-in. piece. Next place one of the 4-ft. 10-in. pieces 14 inches from this, and the other 4-ft. 10-in. piece between the ends of the 7-ft. 2-in. pieces, and nail securely together. Turn this over, and it will form the bottom frame of the house. Then take four pieces of 2 x 1, 4 feet long, and cut the ends by the template shown, which is actual size, No. 1 for the top to receive the ridge pole, No. 2 for the bottom, which fits the bottom frame. Place two of these pieces in position at the front, and two at the back, and nail to the 3 x 1 frame inside; put the 8-ft. ridge pole in the places cut to receive it, allowing it to project 6 inches in front and 18 inches at the back. This provides a good hand hold for shifting the house about. Then take the other two pieces of 4-ft. timber; use the same template, but cut the angles on the flat as these two pieces are for the centre of the house where the ruberoid joins.



Template No. 1.



Template No. 2.

Next cut the two pieces of 3-ft. timber so that they will fit between the uprights at each end of the house; on these the perches will rest. Cut the piece of 1 ft. 4 in. to fit between the uprights at the back 8 inches from the top; this is for ventilation. Then nail the two pieces of 1 ft. 3 in., 1 foot apart, to the bottom frame at the front, so as to form the door frame; the tops of these help to support the 3-ft. piece on which the perches rest. Nail the piece of 3 ft. 4 in. across the back, 1 foot from the bottom frame, so that the hinged lid of the nest tins can be hung to it. Then take the six pieces of 14-gauge wire; drill holes 8 inches apart in the bottom frame of the house; fasten one end of each of the wires in these holes, pass the other ends over the ridge pole, stretch fairly tightly, and fasten to the frame at the bottom on the other side. These wires support the ruberoid, and prevent it from sagging. One kerosene tin flattened out and cut in half is sufficient to close in the spaces each side of the door; the space above the door is covered by a piece of wire netting.

To close in the back, make a light frame, and cover with a piece of tin 3 ft. 3 in. x 1 ft. 3 in. By hinging this to the 3-ft. 4-in. piece of timber at the back a lid is made for the nest tins. Flatten out a whole kerosene tin and half of another. Spread a quarter of the

[*Continued on page 403.*

TUBERCULOSIS

Contributed by
the Live Stock Division

TUBERCULOSIS is a contagious disease of animals and man and is prevalent in almost every country in the world. Human beings and cattle are its chief victims, and although there is no species of animal completely resistant to infection, natural cases in sheep and goats are rare. The extent of the disease among swine depends to some extent on the opportunities of infection from other stock, such as cattle. In dairying districts if a large percentage of cattle are tuberculous, the incidence in pigs is usually high.

As a rule tuberculosis is a chronic insidious disease; it develops slowly and an animal may be affected for months and sometimes years before obvious signs of ill health appear. If the losses from tuberculosis were more spectacular, with a rapid development of symptoms and with death occurring in a few days, owners of live stock would soon take steps to check its progress, and to protect the remainder of the herd. Its chronic nature, and gradual spread frequently mean that great damage is done before attempts at control are undertaken.

Cause

Tuberculosis is caused by infection with the tubercle bacillus (*Mycobacterium tuberculosis*). There are three different types of tubercle bacilli, the human, bovine and avian, so called because they are the varieties which are most common in man, cattle and birds respectively. Each type or variety however, is capable of infecting other species. For instance, although the bovine type is the common cause of natural tuberculosis in cattle, human beings, especially children, are susceptible to bovine infections which usually arise from the consumption of milk from tuberculous cattle. Further, swine are susceptible to bovine tuberculosis, and the majority of tuberculous dogs and cats are infected with the bovine type.

Poultry are naturally infected only by the avian type which, however, is capable of causing disease in cattle and swine, although the lesions in these animals are usually localized, and show little tendency for the development of extensive tuberculosis.

The human type is predominantly found in man, but occasional infections have been noted in dogs and cats.

Contributory Causes.—Tubercle bacilli are necessary for the development of tuberculosis, but their spread from animal to animal is encouraged by external conditions which tend to lower the stamina of the stock, such as insanitary and ill-ventilated surroundings, overcrowding, and insufficient or unsuitable food. It must be realized, however, that ideal hygienic conditions and perfect sanitation alone will not prevent tuberculosis.

Small nodular tubercles from the pleura of a cow.
[After *Mohler and Eichhorn.*

Symptoms

There is no symptom that can be relied on to detect tuberculosis with certainty. Any of the symptoms shown by a tuberculous animal may be caused by some other disease, and not one of them is characteristic of tuberculosis alone. Further, it must be clearly remembered that cattle may be extensively diseased, and yet show no

symptom of ill health. Quite frequently, apparently healthy fat beasts slaughtered at an abattoirs, are found, on subsequent inspection, to be diseased so extensively that the whole carcass is condemned as unfit for human consumption.

The more important symptoms which may be exhibited by tuberculous animals are :—

Unthriftiness.—The animal has a rough coat, its skin feels harsh, and it is not doing as well as it should, considering the care and feed it receives.

Loss of Flesh.—This may be gradual, although when there is an extra demand on the animal's body, as with a newly calved cow which is producing heavily, condition may be rapidly lost.

Cough and Noisy Respiration, and Enlarged Glands.—A cough may indicate tuberculosis of the lungs or of some part of the respiratory tract. Noisy respirations may be an accompaniment of pulmonary tuberculosis, and the tuberculous enlargement of glands associated with the throat may cause snoring, or difficulty in breathing. Involvement of the superficial lymph glands is not uncommonly seen. They become enlarged and hardened, and when felt with the hand the glands are frequently nodulated. A gradually enlarging lymph gland, painless and firm to the touch, is a sign that should be viewed with suspicion.

Post-Mortem Appearances

The characteristic lesions of tuberculosis are nodules or tubercles which may be so small as to be scarcely noticeable, or they may be as large as the closed fist, or even larger. They may be found in almost any part or organ of the body, although tuberculosis of the muscles and skin is rarely seen. The lungs are favourite sites for the disease, and the lymph glands associated with the lungs, and those in the throat are most frequently affected. If these lumps are incised, the contents may be seen to vary from a creamy pus to a cheesy mass, and in older lesions the diseased tissue may grate on the knife like sand, owing to the deposition of lime salts. In swine, the lesions are whitish and the majority are found in the lymph glands of the head and throat, although as with cattle, they may be found anywhere in the body.

Economic Importance and Relation to Public Health

The importance of tuberculosis must be viewed from two aspects :—the economic significance to the live stock industry, and its influence on public health.

1. Tuberculosis may be responsible for financial loss to the stockowner, whether he raises beef cattle, or conducts a dairy farm or breeds and fattens pigs. This economic wastage may result from deaths among stock, from the waste of food given in attempts to maintain or improve the condition of tuberculous animals, and from the condemnation of carcasses in abattoirs when cattle and pigs are sent for slaughter.

2. The significance of bovine tuberculosis in relation to human life and health can hardly be estimated on a monetary basis. Adults may be affected, but most often bovine infections occur in children under five years of age.

Although deaths in children may occur from affections such as tuberculous meningitis and abdominal tuberculosis, the involvement of bones and joints and infections of the glands in the neck, while not necessarily fatal, are crippling diseases responsible for deformities and much suffering and ill health.

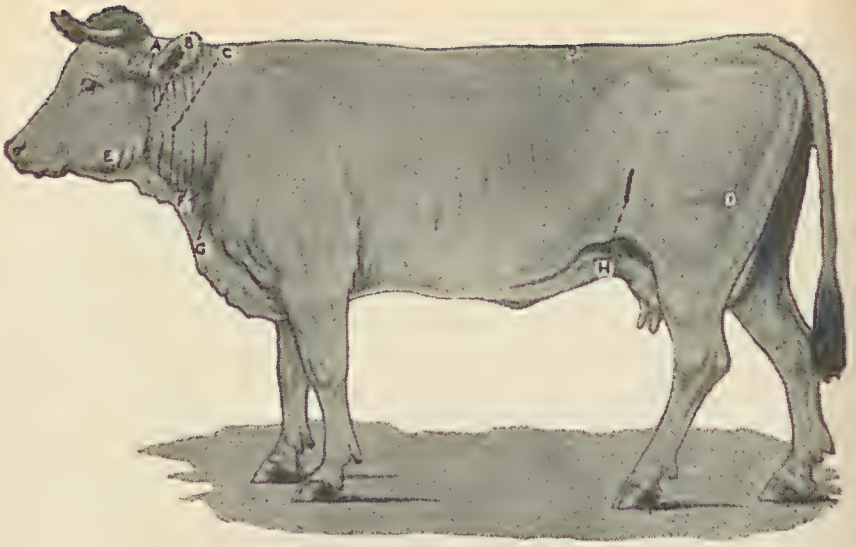
Judging from information gained by the Department of Agriculture, the extent of infection in the beef and dairy herds of this State is not as great as in many countries of the world. Recent tests on dairy cattle supplying milk to some of the larger cities have shown a remarkably low general incidence of tuberculosis.

Although the average is low, nevertheless individual herds have been discovered with an incidence of the disease sufficiently high to cause direct financial loss to the owners, and to expose human beings, especially children, to serious risk of infection.

How Tuberculosis Spreads

In the majority of cases, the tuberculous lesions progress until the animal is discharging tubercle bacilli to the exterior. Lung lesions ultimately ulcerate or break down, discharging infective material into the air passages. This material is then coughed up and tubercle bacilli may be sprayed during a coughing spasm into the air; or, because cows do not expectorate, most of the material coughed up from the lungs is swallowed, and ultimately is discharged with the faeces. Tuberculosis of the digestive organs also results eventually in the infection of the faeces with tubercle bacilli. Thus the distribution of infective material into the air

especially of cow sheds, and on pastures provides the source of infection, not only for cattle but for other susceptible animals housed with or grazing in company with tuberculous subjects. When the udder is tuberculous, the milk contains tubercle bacilli which readily transmit the disease to calves, swine and human beings, especially children. Even when the udder is not infected, manure containing tubercle bacilli may find its way into the milk. It is possible for milk to be highly dangerous and yet have a normal appearance and taste.



Superficial lymph glands of a cow.

A—Parotid gland. B—Superior. C—Middle. D—Supramammary gland. E—Submaxillary gland. F—Prescapular gland. G—Inferior cervicle glands. H—Precural glands. [After *Hatjra and Marek.*

How Tuberculosis is Introduced into a Herd

The disease may be introduced into a herd in a number of ways. First, a bull or other animal infected with tuberculosis may be purchased. There may be no reason to suspect that the animal is diseased; on a casual inspection it may be apparently healthy For their own protection, owners should acquire stock only from herds known to be free from tuberculosis, or they should insist that the animals should give a negative reaction to the tuberculin test before purchase.

Secondly, calves and swine may be infected with milk, skim milk or whey that has come from tuberculous cattle. Skim milk, or whey, usually comes from the mixed milk or cream from a number of herds, some of which may contain tuberculous cows, and for this reason The Regulations of the Stock Diseases Act require that skim milk or whey must be heated before leaving the factory. Similarly, meat and offal from diseased cattle should not be fed to swine in the raw state.

Thirdly, the exhibition of cattle at Agricultural Shows may expose them to contact with tuberculous animals, unless steps are taken by the Show authorities to confine entries to healthy tubercle-free stock.

Fourthly, healthy cattle may be transported in trucks or other vehicles that have not been efficiently disinfected after carrying diseased animals.

Fifthly, cattle may be grazed on common land or on pastures to which tuberculous cattle have access. Swine and cattle may acquire the avian form of tuberculosis by contact with infected poultry.

How Tuberculosis can be Controlled and Eliminated

One of the most valuable weapons available to the veterinarian for the control of the disease, is the tuberculin test. Tuberculin is a liquid which contains the products of growth of tubercle bacilli from which the germs themselves have been removed. Because it contains no living bacilli, under no circumstances can its inoculation produce tuberculosis. Tuberculin is incapable of causing any ill effects on healthy cattle, but its effect on tuberculous animals varies according to the way in which it is used. Cattle and other animals infected with tuberculosis develop a sensitivity to tuberculin, and when this substance is injected in a suitable dose, a definite reaction can be detected in a tuberculous subject by a competent and experienced veterinarian; that is to say, a diagnosis of tuberculosis can be made, with a high degree of accuracy, by the tuberculin test.

The tuberculin test is exceedingly reliable, and its systematic use makes possible the elimination of tuberculosis even from a heavily infected herd.

In attempts to eradicate tuberculosis, however, the elimination of reactors to the tuberculin test may prove a long and costly procedure unless it is accompanied by rigid sanitary measures and adequate disinfection. In countries where cattle are housed for long periods, dark, dirty and crowded stables help to perpetuate infection. In Australia, climatic conditions generally are favourable to the control of tuberculosis; nevertheless, cow sheds should be well lighted and well ventilated, with efficient drainage. The

[*Continued on page* 403.

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

ON the 19th June last, National Security (Agricultural Machinery) Regulations came into force to control the manufacture and distribution of agricultural machinery. With this control, it is hoped that manufactures and imports of spare parts and new machines can be maintained or raised to meet all essential requirements. The position had become so serious, however, that it will be some considerable time before all essential requirements will be supplied.

The purchase of machinery is under two controls—A and B. Under control A, the manufacture is controlled on a quota basis, and distribution is vested with the manufacturers and distributors, who certify to the essential need of the farmers' requirements before giving delivery. Under control B, manufacture and distribution are both controlled, and before delivery can be given a permit must be procured from the Controller of Agricultural Machinery or his Deputy in the Department of Agriculture of Victoria.

With the exception of overhead irrigation and orchard spray outfits, all the classes of machinery listed in control B are of concern to graziers, dairy, pig, and poultry farmers. Engines and agricultural machinery for the functioning of which an engine is in-built or an integral part, tractor and engine-operated rotary hoes, engine-operated sheep jetting plants, cream separators, shearing machines, comb and cutter grinders, tractors (both new and second-hand), and windmills are listed in control B.

Tractors are the only second-hand agricultural machines under control, and present owners can only sell their tractors subject to a permit being issued.

As from the 19th June last, an application form (form B) must be filled in by the farmer when lodging his order for any of these machines, and this form must be forwarded to the nearest Local and District (Regional) War Agricultural Committee, which will certify to the need for this machine, or arrange locally so that the farmer can carry on with his existing equipment.

It must be fully realized that a permit will be issued only for the release and delivery of machinery that is in stock and available for immediate delivery. Applications for machinery that is not in stock will be refused on the grounds that the machinery is not available, and a new application will have to be made should the equipment become available later.

Engines are particularly scarce, and it is most difficult to distribute those available to farmers in most urgent need of them. It is well known that large dairy farmers cannot carry on without an engine to drive the milking machines, and in cases of a breakdown everything will be done to expedite the issuing of a permit, but, before representations are made to the Department of Agriculture, the Chairman of the District or Local War Agricultural Committee, the local Dairy Supervisor, the local Lands Inspector, or other local official of the Department of Agriculture should be contacted to certify to the urgent need for a new engine. When a separator breaks down, similar steps should be taken to expedite delivery and save any wastage of cream.

It is not generally known that repairs to farm machinery are in priority three, the highest for civilian vehicles and implements. At all engineering workshops, garages and blacksmiths, farm implements and machinery must, therefore, be repaired before primary producers' motor vehicles, which are in priority four, and vehicles and machinery in lower priorities.

Sheep

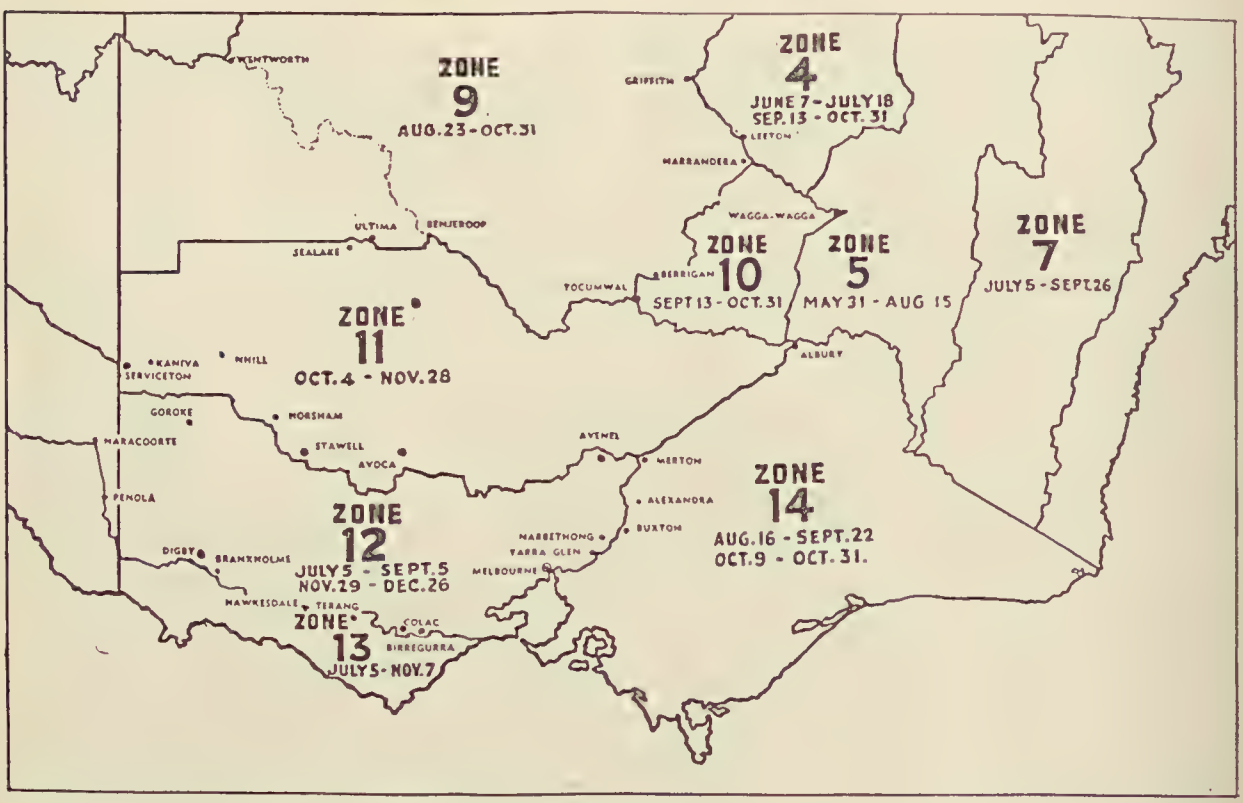
The accompanying map has been inserted to remind sheep-owners that, under National Security (Shearing of Sheep) Regulations, the shearing of flocks in excess of 1,000 head of adult sheep (over 6 months old), by persons other than their regular and permanent employes, is prohibited during certain periods of the year.

The prohibited shearing periods in Victorian zones are as follow:—

Zone 9	..	August 23rd to October 31st.
Zone 11	..	October 4th to November 28th.
Zone 12	..	July 5th to September 5th, and November 29th to December 26th.
Zone 13	..	July 5th to November 7th.
Zone 14	..	August 16th to September 22nd, and October 9th to October 31st.

Dairy Cows

Every blade of grass that can be conserved in October, November, December, or even, in late districts, January will be required for future use, and arrangements for harvest should be



Shearing zones.

The dates given above are for the periods in which sheep in each particular zone may **NOT** be shorn.

planned now. Select the paddocks to be cut for hay or silage, and clear them of wire, stones, logs and other obstructions likely to break the mower or other harvesting machines. This is most important because of the difficulty of obtaining spare parts and having repairs made to machinery at the present time.

Wherever possible different pasture paddocks should be cut for hay each year.

Extra help at harvest time will be a problem again this year, but, wherever possible, arrangements should be made with friends in business, professional and industrial undertakings to take their annual leave and spend it harvesting. In many instances the employer may not desire to grant leave at such a time, but if the employee desires, the Man Power Directorate could be approached and asked to decide whether leave should be granted or not.

Thousands of tons of grass hay are spoilt each year because the grass is too mature when cut. Early cutting lengthens the harvest period, and ensures that the grass is cut while it is leafy and green, and before it is stemmy and dry. Leafy, green hay is much more nutritious and palatable than mature hay. Certainly the days are short, and the dews heavy, factors militating against rapid curing, but, provided there is no rain, the mower should be put into commission at the earliest possible date, and the freshly cut sward raked into windrows almost immediately and stacked when it is cured.

These piglings have been born right, but will they survive to weaning time ?

How many Pigs will be saved ?

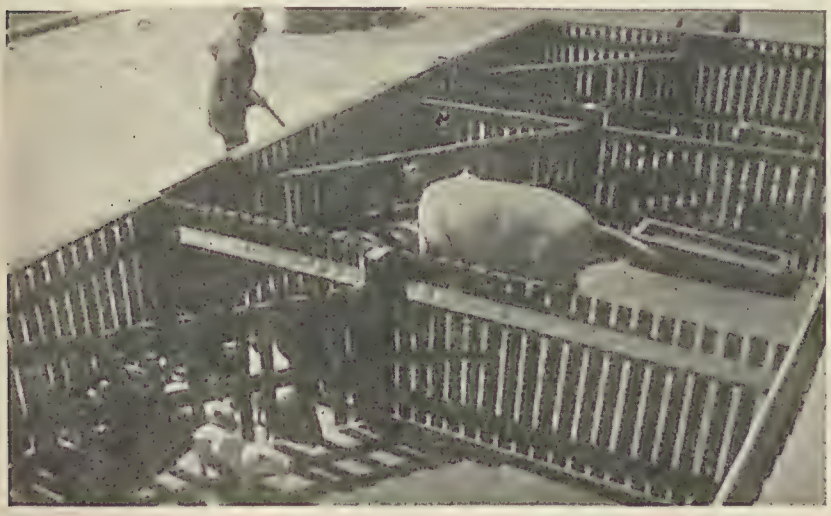
This being the time of arrival of spring litters it is opportune to remind pig-raisers that about 25 per cent. of pigs born do not survive to weaning age.

Individual pig-raisers can never afford such a loss, and at present the nation cannot afford to lose so much potential bacon.

This serious waste is considered by some to be inevitable, but a study of the variations in the extent of the loss between different sows, and on different farms leads to the conclusion that many pigs could be saved through better management.

Factors affecting the number and size of pigs weaned per litter start right back with the selection and treatment of the brood sow prior to her mating and during her pregnancy, but as spring litters are now being born, and it is important that they should be saved, the following suggestions are made with regard to treatment of these litters, so that losses of suckers will be kept at a minimum.

Do not feed the sow heavily during the first two days after she farrows, but give her plenty of water or milk to drink. From then on her ration may be increased gradually so that by the end of the first week after farrowing she is receiving all she can consume either in three meals daily or from a self-feeder. Full feeding should continue for the remainder of the eight weeks' suckling period.



Creeps in the intensive pens at the Sunbury Mental Hospital Farm.

The suckers should be provided with a low trough in a "creep" to which the sow does not have access. This should be done when the litter is three weeks old and the pigs should be given a dry meal mixture such as wheatmeal, barleymeal or pollard with 20 per cent. meatmeal added, if separated milk is not available. Either milk or water should be available to them also when dry food is offered. The trough should be kept clean.

The sow should be placed in a clean pen or paddock with a shelter before she farrows, and she and her litter should be given the cleanest pen or paddock, preferably a grass paddock which has not carried pigs for some months.

If the sow and litter have not the run of a pasture they should be given green food every day. Also, if the suckers have not a run on the soil, but are kept in intensive pens with impervious floors they should be supplied every day with a shovel full of fresh soil placed on the floor of their pen.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry Notes

Every endeavour should be made to produce a high percentage of clean eggs of good size, shape, texture and thickness of shell. The production of such eggs will give the poultry farmer an excellent reputation and the eggs, when marketed, will realize the highest prices.

The testing of eggs for quality is done by candling—the examination of the egg shell and its contents in front of a strong ray of light. The quality of the egg is assessed when it is held before the light, and the method is extremely accurate when practised by experts.

The chief points to be noted when candling are texture and thickness of shell, size of air space, condition of yolk, condition of white and presence of internal blemishes, such as blood spots, &c. It is comparatively easy to detect small cracks, foreign bodies and size of air space but the finer differences of internal quality can be judged only by a highly skilled worker.

The defect known as "watery white" is difficult to define in some cases. The true "watery white" egg is one in which the white runs all over the pan when the egg is broken for cooking. It is sometimes due to bad packing and rough handling in transit, but the condition is found in new-laid eggs as well. It also may be caused by staleness, especially during the hotter months of the year.

Egg size is governed by breeding, feeding and other factors. Good results cannot be obtained from poorly fed fowls of indifferent breeding. Feeding is important. A laying hen must receive a properly balanced ration for best results.

Quality of eggs is affected by the feeding of unsuitable foods, by allowing the rooster to run with the hens, resulting in fertile eggs germinating in hot weather, and by holding eggs too long before despatch to market.

Eggs should be collected at least twice daily, and when cool, packed with the large ends up in clean fillers and flats. They should be stored in a cool well-ventilated place free from direct draughts, away from odorous goods, and marketed at least twice weekly during the hot weather.

Deterioration of the contents of weak-shelled eggs is rapid, because the shell offers less resistance to evaporation, and bacteria and abnormal odours penetrate the shell more easily.

Ample nesting accommodation should be provided and nesting material and floor litter should be clean, dry and replaced at frequent intervals.

Endeavour to obtain a high percentage of clean eggs from the nest and avoid washing clean eggs with the soiled ones.

The report on the adverse effect of washing on the keeping quality of eggs, published in the July issue of this Journal, should be read by every poultry farmer.

[H. F. Clinton, Poultry Expert.]

Horses

Increased hand-feeding of horses will be necessary for some considerable time. Where available, small quantities of lucerne chaff can be added to shandy or oaten chaff. Such mixed chaff makes a better food than either lucerne or cereal chaff fed separately.

Stallion owners should see that horses doing stud work are liberally fed, well-groomed, and given regular exercise. At this time of the year especially, extra attention to grooming should be given.

Where the pastures are still dry, the desirable green feed for foals, young horses, or brood mares can be partially made good by feeding some good quality, green leafy lucerne chaff. In the past cod liver oil has been used when green food is not available, but it is practically unprocurable at the present time. Suitable fish oil substitutes are available, however, and give excellent results when added to the ration.

[W. D. Shew, B.V.Sc., Senior Veterinary Officer.]

Bees

With the approach of spring, interest will now centre on brood rearing within the hive. The variable weather usual during this month, is not conducive to the gathering of nectar, and the young larvae must be fed from reserve stores. If the weather is unfavourable for opening the hives, a fair estimate of the remaining stores may be ascertained by raising the rear of the hive a few inches, and comparing the weight with that of a hive known to contain ample for the immediate requirements of the colony. Moderately light hives should be marked for attention as soon as the weather permits.

Where lack of weight would suggest depletion of stores, weather conditions should be ignored and the interior of the hive inspected. In extreme cases it may be necessary to transfer a comb of honey from a more prosperous colony pending an opportunity of feeding with sugar syrup. Bees in the North-East and Goulburn Valley districts will need immediate and careful attention as the autumn flow of nectar in both of these areas was light.

Grass should not be tolerated near the hive entrance. Use of the spade in the vicinity of each hive entrance may often prevent the loss of field bees trying to return to the hive through a maze of wet grass after a cold bleak shower.

Spare combs should be overhauled, and those affected with wax moth larvae treated as advised in previous notes. If carbon bi-sulphide cannot be procured, fumigation by tiering the supers containing the affected combs over an empty super in which a shallow dish of burning sulphur has been placed, should prove effective.

[J. W. Thomlinson, Apiary Inspector.]

REARING CHICKENS ON THE COLONY SYSTEM—*(continued from page 395.)*

flattened tin over the spaces each side of this hinged lid; the balance will be required to close in the space between the hinged lid and the ventilator. Two inches of the bottom of this tin should be bent outwards at right angles, in order to prevent rain running down the back of the house into the nests.

The ventilator space, about 1 foot by 8 inches to the peak, should be covered with a piece of wire netting. Bore the holes 1 foot apart in the two pieces of timber that are to support the perches, and corresponding holes in the ends of the perches. They can then be held in position by placing a nail in the holes. This will enable perches to be easily removed at any time for inspection for mites, &c. The ruberoid can then be tacked on, the door fitted, and the house is complete.

Rearing Calves Without Separated Milk

Where whole milk is sold direct from the farm to a retailer or a dairy factory, little or no milk is available for calf rearing, and the dairy herd may suffer through the owner failing to rear his own heifers or not rearing them properly because of milk deficient diet.

However, calves can be reared cheaply and well on as little as 25 gallons of milk each. This is all fed during the first five weeks. The milk must be supplmented by a gruel made of equal parts of pollard and linseed meal, to which a cupful of lime water has been added. Half a pound of pollard and half a pound of linseed meal, boiled in one gallon of water to which a cupful of lime water has been added, cooled to 90 deg. F., provides a cheap and excellent meal for a six-weeks-old calf.

The calf should receive new milk until it is two weeks old, when a start can be made to replace the new milk with the gruel. By the time the calf is six weeks old all the milk can be replaced by gruel.

Calves, receiving no fresh milk, either whole or separated, should always be grazed on green pastures or given some green lucerne hay.

Calves, born early in the season and reared well, always develop into the best dairy cows.

[Contributed by the Live Stock Division.]

TUBERCULOSIS—*(continued from page 398.)*

disinfection of milking sheds, mangers, water troughs and yards must be rigorously carried out.

Owners of stock who have discovered or who suspect the presence of tuberculosis in their herds, or who desire to maintain their animals free from this disease, should seek the advice of a qualified veterinarian, or of the Live Stock Division of the Department of Agriculture, Melbourne, C.2.

POULTRY FEEDING TESTS

1942-43 Results

By W. O. PEDERICK and A. G. CLARK

The most profitable egg production in the tests was obtained by feeding a variety of whole grains and free choice meat-meal. The birds receiving such rations averaged 182 eggs and consumed 97·6 lb. food, while birds receiving the ordinary bran, pollard and meat-meal mash and mixed whole grains, averaged 181 eggs and consumed 100·8 lb. of food.

EXTENDING over a period of twelve months from 1st April, 1942, to 31st March, 1943, poultry feeding tests were conducted at the State Research Farm, Werribee, to compare the respective values of rations containing no bran and pollard with the standard bran and pollard ration.

For the purpose, 250 Australorp pullets and 250 White Leghorn pullets hatched in August and September, 1941, were used, and divided into ten pens each containing 50 birds.

The birds were intensively housed in a laying shed 110 feet long by 20 feet deep, divided into ten pens each 11 feet by 20 feet, which provided a little over 4 square feet of floor space per bird.

The following rations were fed to the different pens:—

Pens Nos. 1 (Australorps) and 10 (White Leghorns).—No mash. Mixed whole grains always available in hopper. Meatmeal always available in hopper.

Pens Nos. 2 (Australorps) and 9 (White Leghorns).—Dry mash consisting of crushed mixed grains and 10 per cent. meatmeal. Mixed whole grains always available in hopper.

Pens Nos. 3 (Australorps) and 8 (White Leghorns).—Dry mash consisting of crushed mixed grains and 10 per cent. meatmeal. Mixed whole grain fed in litter.

Pens Nos. 4 (Australorps) and 7 (White Leghorns).—Dry mash consisting of bran, pollard, and 10 per cent. meatmeal. Mixed whole grain fed in litter.

Pens Nos. 5 (Australorps) and 6 (White Leghorns).—No mash. Mixed whole grain fed in litter twice a day. Meatmeal always available in hopper.

All the grain mixtures, both whole and crushed, consisted of four parts wheat, one part oats, one part barley, one part maize (by weight). The bran and pollard mash consisted of 30 lb. bran, 60 lb. pollard, and 10 lb. meatmeal.

Green feed was fed to each pen daily, and shell grit was always available.

As in previous tests, the cost of food was arrived at by taking the average wholesale prices published in the daily press during the year. Delivery charges were not added. The crushed grain was valued at 3d. per bushel more than whole grain. The eggs laid were valued at the gross wholesale hen egg price without deducting any marketing charges. These charges would probably average approximately 4d. per dozen, which with an average production of 180 eggs would amount to 5s. per bird per year.

The results of the test are set out in the accompanying table which shows the quantities and cost of the food consumed, the number of eggs laid, their value, and the return over food cost.

A mild outbreak of chicken pox which occurred in the five pens of White Leghorns was responsible for the lower egg yield of the Leghorns. The Australorps were not affected sufficiently to influence their production.

For the purpose of comparing results the various feeding systems have been grouped as follow:—

Pens 1, 5, 6, and 10.—Whole grain with meatmeal always available. No mash.

Pens 2, 3, 8, and 9.—Dry mash consisting of crushed grain with 10 per cent. meatmeal and whole grain.

Pens 4 and 7.—Dry mash consisting of bran and pollard with 10 per cent. meatmeal and whole grain.

The amount of grain fed to the birds in Pens 5 and 6 is higher than the amount consumed in the other pens. This is largely due to the fact that a regular amount of grain (namely 13 lb. per day) was fed, but at certain times during the year some of this was not eaten by the birds and was wasted in the litter.

Conclusions

The tests have shown that highly satisfactory results can be obtained by feeding whole grain and no mash, provided that the necessary amount of meatmeal is consumed to balance the ration. In the pens where crushed and whole grain were fed with a limited amount of meatmeal, the results were not so satisfactory.

Bran and pollard contain more protein than crushed or whole grain, therefore the limited amount of meatmeal gave better returns with bran and pollard than with crushed grain. Also, where the higher percentage of meatmeal was consumed, it required less food to produce each dozen eggs. This indicates that it is uneconomical to feed a ration that does not contain the right percentage of meatmeal. That percentage, of course, should vary according to the kinds of foods used—crushed or whole grain apparently requiring more than bran and pollard.

In view of the shortage of bran and pollard and the difficulties of transport, the simple method of feeding a variety of whole grains plus free choice meatmeal can be recommended, especially to farmers and others who are keeping poultry as a side-line. The importance of using a variety of grains should not be overlooked. It is doubtful whether such satisfactory results would be obtained from birds housed intensively, if only one grain such as wheat were used. In these tests the grain consisted of wheat, oats, maize, and barley.

Whole grain has not to be crushed or treated in any way, and in this respect it is much cheaper than other foods. Another advantage of whole grain is that it cannot be adulterated without detection.

To reduce cost, whole grain should be purchased where possible direct from the grower or the Boards controlling its distribution.

In earlier experiments when birds were fed with whole grain and meatmeal only, the results were not so clearly in favour of feeding such a ration as in the present tests. This is partly explained by the fact that the meatmeals used were not as palatable or of such good quality as those used in this test—the protein content being much lower. Wherever possible meatmeals containing at least 60 per cent. protein should be used.

Test No. 23.—Werribee Feed Tests, 1st April, 1942, to 31st March, 1943 (12 Months).

Pen No.	Fifty Birds per Pen.	Foodstuffs.	Bran.	Pollard.	Crushed Wheat.	Crushed Oats.	Crushed Maize.	Crushed Barley.	Meat-meal.	Wheat.	Oats.	Maize.	Barley.	Total Food Consumed.	Cost of Food.	Eggs Laid.	Value of Eggs.	Return over Food Cost.
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.		£ s. d.	£ s. d.
1	Australorps ..	Mixed grain in hopper; meat-meal in hopper	..	..	..	..	..	..	580	2,119	530	530	530	4,289	16 16 1	9,042	63 10 5	46 14 4
		Average	..	..	..	..	..	..	..	..	..	..	..	**85·8**	**0 6 9**	**180·8**	**1 5 5**	**0 18 8**
2	Australorps ..	Dry mash — crushed grain; mixed grain in hopper	..	..	1,047	261	261	261	203	1,480	370	370	370	4,623	17 10 2	8,069	57 7 3	39 17 1
		Average	..	..	..	..	..	..	..	..	..	..	..	**92·5**	**0 7 0**	**161·4**	**1 2 11**	**0 15 11**
3	Australorps ..	Dry mash — crushed grain; mixed grain in litter	..	..	1,202	324	324	324	251	1,356	339	339	339	4,887	18 13 9	8,434	59 18 9	41 5 0
		Average	..	..	..	..	..	..	..	..	..	..	..	**97·7**	**0 7 6**	**168·7**	**1 4 0**	**0 16 6**
4	Australorps ..	Dry mash—bran and pollard; mixed grain in litter	752	1,504	..	..	..	..	250	1,356	339	339	339	4,879	16 15 10	9,167	64 3 5	47 7 7
		Average	..	..	..	..	..	..	..	..	..	..	..	**97·6**	**0 6 9**	**183·3**	**1 5 8**	**0 18 11**
5	Australorps ..	Mixed grain in litter; meat-meal in hoppers	..	..	..	..	..	..	572	2,711	678	678	678	5,317	20 9 8	9,654	67 4 11	46 15 3
		Average	..	..	..	..	..	..	..	..	..	..	..	**106·3**	**0 8 2**	**193·1**	**1 6 11**	**0 18 9**
6	White Leghorns	Mixed grain in litter; meat-meal in hoppers	..	..	..	..	..	..	663	2,711	678	678	678	5,408	21 0 7	8,519	59 8 4	38 7 9
		Average	..	..	..	..	..	..	..	..	..	..	..	**103·2**	**0 8 5**	**170·4**	**1 3 9**	**0 15 4**
7	White Leghorns	Dry mash—bran and pollard; mixed grain in litter	850	1,699	..	..	..	..	283	1,356	339	339	339	5,205	17 17 6	9,012	62 18 10	45 1 4
		Average	..	..	..	..	..	..	..	..	..	..	..	**104·1**	**0 7 2**	**180·2**	**1 5 2**	**0 18 0**
8	White Leghorns	Dry mash — crushed grain; mixed grain in litter	..	..	1,331	332	332	332	258	1,356	339	339	339	4,958	18 19 5	7,076	50 4 11	31 5 6
		Average	..	..	..	..	..	..	..	..	..	..	..	**99·2**	**0 7 7**	**141·5**	**1 0 1**	**0 12 6**
9	White Leghorns	Dry mash — crushed grain; mixed grain in hopper	..	..	1,146	286	286	286	222	1,203	323	323	323	4,488	17 2 5	7,418	52 1 0	34 18 7
		Average	..	..	..	..	..	..	..	..	..	..	..	**89·8**	**0 6 10**	**148·4**	**1 0 10**	**0 14 0**
10	White Leghorns	Mixed grain in hopper; meat-meal in hopper	..	..	..	..	..	..	713	2,173	543	543	543	4,515	17 18 8	9,203	64 2 2	46 3 6
		Average	..	..	..	..	..	..	..	..	..	..	..	**90·3**	**0 7 2**	**184·1**	**1 5 8**	**0 18 6**
		Total for 500 birds ..	..	..	..	..	..	..	..	..	..	..	..	48,569	183 4 1	85,594	601 0 0	417 15 11
		Average	..	..	..	..	..	..	..	..	..	..	..	**97·1**	**0 7 4**	**171·2**	**1 4 0**	**0 16 8**

Notes.—Average gross price of eggs, 1s. 8d. per doz.; food cost per dozen eggs, 6·2 pence; food consumed per egg laid, 9 oz.; food consumed per bird per day, 4·3 oz.; cost of food per bird per week, 1·7 pence.

Results of Various Systems of Feeding.

——	Systems of Feeding.	Food Fed per Bird.	Meatmeal—percentage of Total Food.	Food Fed per Dozen Eggs Laid.	Average Production per Bird.
		lb.	per cent.	lb.	eggs
Pens 1, 5, 6, and 10	Whole grains with meatmeal always available	97·6	13·1	6·5	182
Pens 2, 3, 8, and 9	Crushed grain with 10 per cent. meatmeal and whole grain ..	94·8	4·9	7·2	155
Pens 4 and 7 ..	Bran and pollard with 10 per cent meatmeal and whole grain ..	100·8	5·2	6·7	181

IN THE ORCHARD

Contributed by the Horticultural Division

Nitrate of Soda

BECAUSE of the very dry autumn, the attempt by fruitgrowers to provide a supply of nitrogen to their trees by the growing of leguminous green crops has largely failed, except where crops were planted early and irrigated. However, supplies of nitrate of soda, a very useful source of nitrogen, have been obtained and will be available to fruitgrowers at the rate of 2 cwt. per acre. Fruitgrowers should not hesitate to secure their ration as soon as possible so that it can be applied before blossoming. 4 cwt. per acre will be available for non-irrigated citrus. For citrus under irrigation, sulphate of ammonia will be supplied and nitrate of soda may also be obtained if required.

Spring ploughing should be completed during August, especially where green crops have made satisfactory growth. If the green crops are well established, but growth is backward because of late planting, the ploughing should be delayed until after the trees have blossomed so that maximum bulk is obtained and the greatest return will be obtained for the money spent on this practice. Ploughing during the blossom period of apples and pears assists the discharge of spores of black spot disease and therefore should be avoided.

Citrus Pruning and Spraying

All varieties of citrus show some benefit from pruning and although the present shortage of labour may have prevented many growers from devoting much time to this work, some attempt should be made if possible to treat portion of the block each year. Any dead wood should be removed because this interferes with the setting of the fruit, and is a cause of rind blemish on young developing fruit. Trees lacking in vigour through some unfavourable soil condition will benefit by extensive thinning out of growth in order to restore the balance between top and root growth.

A general pruning of healthy orange trees is usually not necessary except for the removal of vigorous upright shoots which are unfruitful and retard the more horizontally growing fruitful branches. Branches hanging low so that the leaves and fruit drag on the ground also should be removed. Such growth becomes infected with fungous diseases which are a source of infection to the rest of the tree. All citrus pruning is best carried out in the spring so that the resultant fresh growth will escape the frost period.

Lemon trees in southern districts should receive a spray of Bordeaux mixture 3 : 3 : 50, after the bulk of the winter crop has been removed. This will prevent any severe infection of anthracnose, brown rot or other fungous diseases.

If trees are infested with soft brown or black scale insects, and sooty mould is spreading over leaves and fruit, a spray of white oil, strength one part in forty of water, should be applied. This spray may be combined with the Bordeaux mixture application.

Trees should also be inspected for the presence of collar rot, a fungous disease which develops on the trunk near ground level, when soil and rubbish pile up around the roots and drainage is poor. All the infected bark and wood should be cut away with a sharp knife and the wood coated with a paste made by mixing one part of bluestone with two parts of slaked lime in water to a smooth paste.

Blossom Removal Sprays

The season promises to be a heavy one for most varieties of fruit. Some apple and pear growers again may be faced with the prospect of having larger areas of fruit than they can handle efficiently with the labour available. Growers are urged to make every effort to produce as much high quality fruit as they can, but it is realised that it is far better to handle a small area efficiently than attempt to work the whole orchard, and then lose a large proportion of the crop through pest and disease. For this reason, the following advice is given to growers who intend to remove the blossom from their trees.

Three substances have proved efficient for blossom removal—cresylic acid, tar distillate, and a spray containing di-nitro-cresol or DNC. The best time to apply the spray is when the young flowers are separated in the clusters and from 5 to 10 per cent. of blossoms are out.

Cresylic acid is effective provided that the pure acid is obtained and mixed with soft soap just before applying the spray. The method is quite simple and is as follows:—Dissolve 3 lb. soft soap in 2 gallons of hot water. When the soap is completely dissolved, add slowly one gallon of pure cresylic acid and stir rapidly. Added to a vat containing 97 gallons of water, this will make a 1 per cent. solution. Cresylic acid at this strength will be effective for most varieties of apples. For Yates, London Pippin, Jonathan, Rokewood, Statesman, and Gravenstein varieties, the strength should be increased to 1¼ per cent. For pears, 1¼ per cent. would be sufficient for Winter Nelis, Winter Cole, and Josephine, but a 1½ per cent. solution should be used for Packham's, Beurre Bosc, W.B.C., and Kieffer.

Tar distillate is effective at 3 per cent. strength on all varieties except Packham's, W.B.C., and Kieffer, when 4 gallons would be required.

D.N.C. sprays may be used at 2 per cent. for apples and 3 per cent. for pears. Growers should spray very thoroughly and avoid having to go over the trees to remove fruit missed by the spray.

If the blossom is removed from pears, growers should watch for the appearance of the pear slug. If this appears, a spray of lead arsenate will protect the leaves from damage.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

THE winter clean-up of the garden should be completed by now with the exception of the pruning of the spring flowering shrubs and trees. These are pruned during and immediately after flowering.

Planting of roses and other plants can be continued this month, but an effort should be made to complete this work as soon as possible.

Perennials and Herbaceous Plants

As soon as growth commences on the herbaceous plants, the clumps, which have become too large, may be divided and replanted in a new site. Perennial phlox, perennial aster (Michaelmas or Easter daisy) armeria (Thrift), campanula, canna, delphinium, rudbeckia, helenium, gazania, geum, and astilbe all form rather large, dense clumps if left undisturbed for many years.

The centre of the clump becomes starved and the quality and profusion of flowers suffer. Every two or three years the clumps should be lifted in late winter or early spring just as growth is commencing. The old worn-out and diseased portions of the clumps should be discarded and the more vigorous, healthy outer portions of the clumps replanted in prepared soil.

If lifting and division of the clumps are postponed until growth has commenced, the healing of wounds is more rapid than it would be in winter when the plants are dormant. Rotting of the plants is avoided and it is much easier to determine the number of new shoots to be retained in each clump.

Place baits, or rough cinders, around plants such as delphiniums to prevent injury from slugs and snails. These pests cause much injury to the young tender shoots early in the season and retard, or may even prevent, the clumps from flowering.

Seed Sowing

Seed sowing of summer and autumn flowering annuals can commence now. Choose a warm, sunny position for the seed-bed and do not sow the seed too thickly. Thickly sown seed results in spindly, weak plants which do not transplant well. By lighter sowings it is also possible for the home gardener to get earlier plants which can be lifted with a small amount of soil adhering to the roots. Such plants transplant with a minimum amount of checking to their growth and losses will be very few.

At this time of the year the seed need be covered with only a very thin layer of soil, not more than ¼ inch, because there is little risk of the surface soil becoming dry. For covering the seed choose a light sandy soil which is known to be fairly free from weed seeds. This will reduce the amount of weeding when the flower seeds germinate. Make the seed-beds level with a rake before scattering the seed, and after sowing, firm the seed into the soil by patting it with the back of the spade. Water it gently, and when the water has soaked away, cover with the fine, sieved sandy soil mentioned above.

Seed of ageratum, celosia, antirrhinum, calliopsis, gaillardia, linaria, and scabious can be sown in the seed-bed. Seeds of nasturtium and larkspur are best sown where they are to remain in the garden.

Pansies and Violas

Pansies and violas make a good spring show and will repay the good cultural treatment given them. Remove all weeds from the beds and keep the surface soil cultivated. A dressing of soot dusted over the surface, and applications of dilute liquid manure every fortnight, will keep the plants vigorous and healthy and increase the size of blooms. Soot contains small amounts of nitrogen and this element assists in maintaining a deep green colour in the foliage.

Gladioli

Gladioli corms which have been stored away should be inspected at regular intervals. The new growing tips on these corms sometimes become infested with aphis. Dusting with an insecticide containing nicotine will control this pest, or naphthalene flakes, when obtainable, may be sprinkled over the corms at the rate of 1 oz. to about 100 corms.

Before gladioli corms are planted, the outer scaley coverings should be removed and the corms dipped in a 1 in 1,000 solution of corrosive sublimate for from 8 to 24 hours. This solution is made by dissolving ¼ oz. of corrosive sublimate (mercuric chloride) in hot water, in a non-metallic vessel, and then diluting it with cold water until the volume is about 12½ pints. This is a very poisonous solution and care should be exercised in handling it.

One of the easiest ways to plant gladioli is to open a trench about 6 inches deep and fork into the bottom of it some well-decayed organic matter. Place the corms about 8 inches apart and then fill the trench with soil. Space the rows at least 18 inches apart.

THE VEGETABLE GARDEN

Silver Beet

During August, seed of silver beet may be sown in seed-beds, in their permanent rows in the garden beds, or young plants may be planted out. If sown in the permanent position a very good plan is to place several seeds at intervals of a foot apart along the rows, which should be spaced about 2 feet apart.

Cover the seed with about ¾ inch of soil, and if a little well-decayed manure has been mixed with this covering, or the soil is sieved, the position of each group of seeds can be easily seen.

When the plants are a few inches high, thin them, leaving only one plant at each interval of a foot along the row. After the plants are well established water them once a fortnight with a solution of nitrate of soda ½ oz. per gallon. Good varieties of silver beet are *Dark Green Broad Ribbed, Fordhook Giant* and *Lucullus.*

Green Peas

Varieties of green peas for planting now could include *English Wonder, Melbourne Market* (syn. William Massey), *Greenfeast,* and *Richard Seddon.*

Prepare the soil by digging in well decomposed stable manure or fowl manure. If this is unobtainable, use an artificial fertilizer such as superphosphate at the rate of 2 oz. per square yard, or blood and bone at about the same rate. Dig this into the soil before sowing. It is not advisable to place the fertilizer in the drill with the seed.

The rows, or drills, should be spaced about 18 inches to 2 feet apart and the peas sown about 3 inches apart and covered to a depth of 1½ inches. Peas like a slightly acid or neutral soil, and if possible choose a bed which has been limed previously. If this is impossible, fork into the surface soil, after the digging just referred to, about 6 oz. of agricultural lime per square yard.

As a regular routine in the vegetable garden, a crop of peas or beans should be sown in each bed at least every third or fourth year. When the crop is harvested the remains of the plants should be dug in to build up soil fertility.

When the young pea plants appear above the surface protection from birds may be necessary. This can be provided by a light brush covering or by strips of old bird-wire netting above the rows.

Leeks

Leeks may be planted out now. The most convenient method of planting is to put the plants in the bottom of a trench about 6 inches deep, spacing them 6 inches apart. Rows should be 2 feet apart because the leek makes a much heavier top than the onion. As the plants grow the soil is filled into the trench gradually and this bleaches the stem. A side dressing of market garden manure 2 oz. per square yard applied when the plants are about a quarter to half grown will be found beneficial. Good varieties are *Musselburgh, London Flag,* and *The Lyon.*

Cheese Industry Expansion

By A. C. E. SMITH, B.Agr.Sc., Cheese Expert

BRITAIN'S food requirements in 1941 were such that the Ministry of Food preferred cheese to butter. To this end the Empire dairying countries and the United States of America increased cheese production considerably, but the trend of the war early in 1942 altered the position. Britain drew her cheese requirements more especially from the United States and Canada, while the quantity taken from New Zealand and Australia approximated that of pre-war days.

The increase in cheese production in Australia is still needed to fill contracts for the forces. Heavy milk deliveries to condenseries have resulted in a low autumn and winter cheese production. It will be necessary, therefore, to maintain a high level of cheese production during the spring if the various requirements are to be met.

Dairy factories changing to cheese manufacture were able to obtain financial assistance from a fund derived from a levy on butter. In Victoria, butter factories changing portion of their supply to cheese did so voluntarily.

Prior to July, 1941, 23 cheese factories were in operation. Four were seasonal, being associated with Melbourne milk depots or dried milk plants. Under the emergency conditions, an additional thirteen factories have been built; two of these are not yet in production. Had it become necessary, these new factories were capable of increasing Victorian cheese production by 100 per cent. This increased production will not be achieved for a number of reasons, of which perhaps the most important is Great Britain's reduced demand for cheese. Another factor was the high price of pigs in 1942. This made cream suppliers loth to change to the supply of whole milk since they considered that the milk-fat differential price was not sufficient to warrant selling out of pigs. Labour shortage also contributed to the position. Trained labour for the new factories had of necessity to be drawn from the existing factories. For the factories to work to capacity there is an actual shortage of trained cheesemakers. The cheesemaker's assistants must be capable of hard physical work. This class of labour is not procurable under present conditions, more especially since a portion of the staff is only employed seasonally. Again the collection of milk requires considerably more transport facilities than cream. Trucks and drivers are limited, and the strain placed on transport limits the quantity of milk that can be handled. Here again, the collection of milk requires drivers of strong physique, especially where 155-lb. cans of milk have to be handled off the ground on a twice-a-day pickup in spring. The necessity of making one truck do more than one round again limits the amount of milk that can be delivered to the factory. Other factors responsible for failure to achieve the goal set includes reduced dairy production due to shortage of dairy farm labour, of concentrated foods, and of fertilizers, while the necessity to divert milk from cheese manufacture to the condenseries during the autumn and winter has made it impossible to convert maximum quantities to cheese.

New Cheese Factories Established

The establishment of new cheese factories was made in districts suitable for milk supply, namely—South Gippsland, the Western District, the Northern Irrigation District, and portion of the North-East. Factory construction, on the whole, was good, the buildings erected being of a permanent nature.

The district in which expansion was possible on a large scale is South Gippsland. Because of favorable climatic conditions, South Gippsland presents ample scope for the supply of good quality milk. A sufficient volume of milk is available in the area immediately surrounding the factories. The milk in this district is well suited to cheese manufacture for a variety of reasons.

It is produced under cool climatic conditions, and, therefore, with clean production and efficient cooling of the milk, the quality of the milk delivered to the factories will be good.

The pastures stay green well into the summer, cows maintain good condition, and as a consequence, firming of the curd is not difficult in the summer and autumn.

The cool conditions for manufacture are also an advantage in that the employees engaged in the more arduous operations, such as firming the curd and drying out the curd, are able to maintain their effort without knocking up.

Fairly satisfactory results have been obtained in the new Gippsland factories during the past season; but in one instance, poor milk quality, a result of failure to produce the milk cleanly, plus failure to install milk coolers, caused the factory concerned a deal of unnecessary extra handling in that the twice-daily collection of milk was prolonged beyond the period in which the milk could be accommodated in the vats available.

The Northern Irrigation District is climatically not so well suited to cheese manufacture as the southern districts, the dry atmospheric conditions experienced in the summer and autumn being more conducive to dust contamination of the milk where the dairy surroundings are not concreted. Higher water temperatures and hot nights render it necessary to collect the milk twice daily over the hot months, bringing the milk into the factory and working a night manufacture shift, or else brine-cooling the milk to 50 deg. F., and pasteurizing it the following morning before commencing manufacture. The heat, too, makes it difficult for the assistants to maintain the necessary effort at the critical stage of manufacture, i.e., wheying off.

An Efficient Factory

This district, however, possesses the advantage of maintaining a high level of production through the spring and summer months, while winter production is considerably above that of the southern district. Two new factories were built in this area, and one factory that had been continuously in production had new and larger premises erected. The Rochester Factory, suituated in the Northern Irrigation District, is outstanding among the new factories in the efforts made by the management to manufacture cheese on sound lines.

Cheese manufacture was commenced at the Rochester Factory in June, 1942. A vigorous policy on the part of the management ensured that the prospective milk suppliers had sufficient milk cans supplied to them and that milk coolers were installed on all farms supplying milk.

A fixed schedule for milk collection on the farms has been adhered to, with the result that the milk is delivered to the factory sufficiently early to limit deterioration, and delivery is spread over a sufficient receiving period to enable continuity of intake, pasteurization and delivery of milk into the vats.

The use of some of the Company's trucks on cream collection, after the milk round has been completed, means that the collection schedule must be rigidly adhered to to enable smooth running of both the butter and the cheese factory.

During the flush of the season some trouble was experienced in arranging a staff capable of accepting responsibility for the various operations, but when this was done the factory was able to get on to a regular "make" of good quality.

The practice finally adopted, in order to satisfactorily cope with the volume of milk received in the flush months, and also to adequately supervise the manufacturing process and conserve labour, was to have the evening's milk delivered between 6.30 p.m. and 8 p.m. This permitted the most economic use of staff in that the last two men to finish the day's cheese manufacture received the night's milk and brine-cooled it, the milk being run into the nearest cheese vats. The following morning this milk was pasteurized and run into the further cheese vats; the time of commencing this operation was arranged so that continuity of manufacture with the morning's milk was obtained.

From the point of view of cheese quality, the brine cooling of the night's milk to a temperature of 50 deg. F. is quite satisfactory, provided that pasteurization of the milk is done immediately prior to commencing manufacture. Fat losses are normal, a good-bodied curd is obtained and the flavour is satisfactory, since bacterial growth has been sufficiently retarded. Failure to pasteurize this brine-cooled milk results in high fat losses.

The Rochester Factory has installed six cheese vats of 1,000-gallon capacity. It is set out so that two presses are available to each vat and, therefore, by working a night shift, a capacity of 12,000 gallons of milk daily is available. Ample milk is available in the district if it is required.

The curing room has capacity for 2,350 x 80 lb. cheese, i.e., 84 tons. This provides storage for 14 days "make" of 14 vats. Temperature control is installed, and the room can be maintained at 50 to 60 deg. F. during the summer months.

The Company was able to obtain an old-type Alfa Laval separator for whey skimming, and an otherwise uneconomic waste of fat has been prevented. Skimmed whey is disposed of by pumping via a wooden pipe line to a block of land a mile away. Ample area is available to take up the waste, and systematic irrigation prevents any nuisance being created.

In the original equipping of most of the new factories temperature control of the curing room was neglected, warm to hot conditions were experienced through the season and, as a result, cheese stored without temperature control became more or less misshapen, rinds cracked, some cheese split, fat oozing occurred, texture and flavour were impaired. Most of the factories concerned have taken the necessary steps to overcome this, and it is to be hoped that the plant can be made available for equipping all the factories requiring temperature control.

In addition to temperature control, humidity control is desirable in the South Gippsland Factories. The particularly humid weather experienced in August and September of 1942 in portion of South Gippsland caused a copious growth of mould on cheese at some factories, and normal shrinkage did not occur. Better attention to ventilation resulted in an improvement in this condition, but in order to satisfactorily control the changing moisture content of the atmosphere, some form of apparatus is desirable. It is only necessary to withdraw moisture from the atmosphere in this district since summer and autumn humidities are never low.

Recommendations

The following recommendations are made for the guidance of cheese manufacturers in the coming spring months:—

Exercise strict control of milk quality. The factory grader can achieve greater improvement in quality by correct grading than by the acceptance of doubtful quality milk, and reference to the Dairy Supervisor. Some factories could assist to improve milk quality by supporting the installation and use of milk coolers. As an additional check to milk quality, apart from grading, the more frequent use of the Methylene Blue Test is recommended. The taking of the sample by the milk grader and tipper may not be possible owing to pressure of milk intake, but the employment of a girl to do this work regularly will overcome this difficulty. The practice of the Glaxo Factory, at Port Fairy, of testing every supplier's milk every two days by Methylene Blue Test is a most desirable one. The grader is provided with information as to the cause of the various taints, and is more able to differentiate between fodder taints, absorbed flavours, and taints of bacterial origin.

The factory must ensure that suppliers' cans are returned in a clean and sterile condition, otherwise suppliers will have sound cause for complaint against the factory, and co-operation in the matter of getting clean milk from suppliers will not be so willingly given. In the washing of the cans with the mechanical washers at present in use, the operator must ensure—

That the cold water rinse is sufficient to remove the milk film. If not, steps should be taken to provide an independent tank and pump for flushing.

The cleanser must be hot enough and strong enough to remove the milk solids.

The drying of the cans should be complete. Pools in the bottom of cans coming from the washer are all too common.

Where the factory has sufficient vat capacity to cope with the flush of milk in one shift, it is desirable that all the cheese should be made on a day shift, provided the factory is able to provide transport and the supplier the cans.

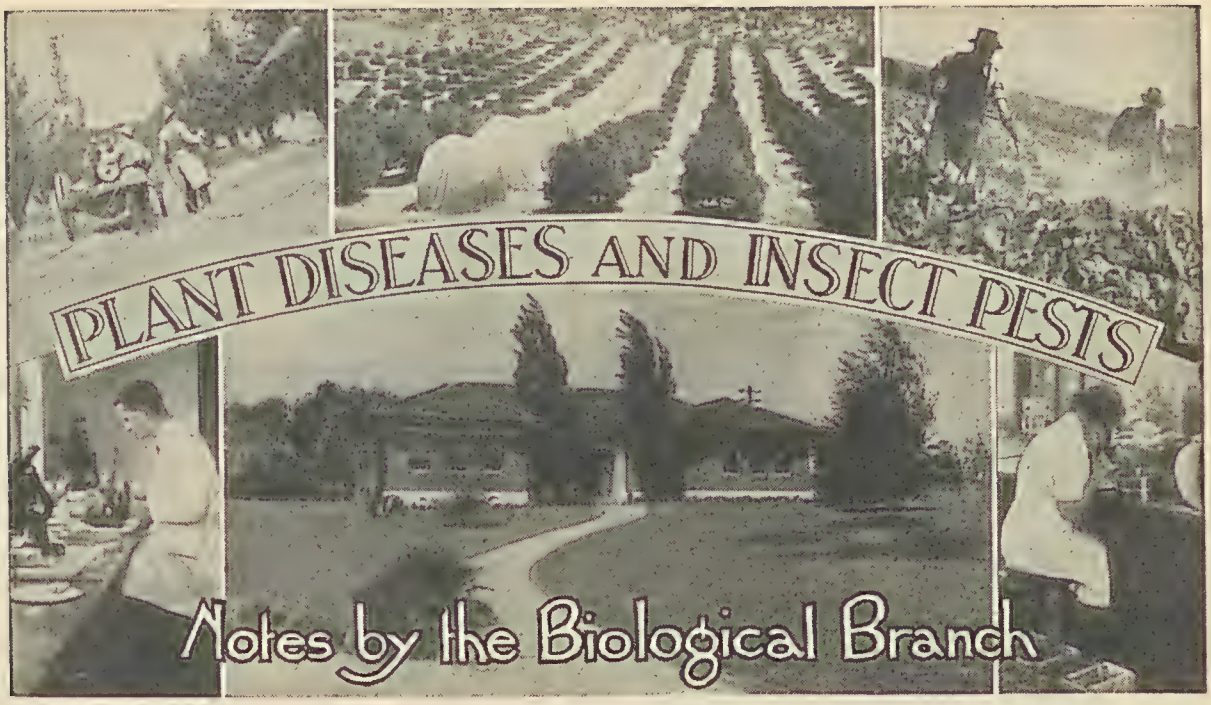
Twice-daily collection of milk tends to make the dairy farmer less particular in his production methods than if he has to keep the milk overnight on the farm. The cost of cans is a small matter as compared with night-shift manufacture. The provision of transport is the limiting factor. If the milk cannot be delivered once daily to the factory for processing within a reasonably short intake period, i.e., continuity of intake at say 1,500 to 2,000 gallons per hour, it is better to collect the milk twice daily and work two shifts of cheese, or if brine cooling is possible, then brine-cool the night's milk on receipt at the factory and commence pasteurization the following morning to precede manufacture of the morning's milk.

Care in the production and cooling of milk permit of once-daily handling; truck drivers are not so likely to become dissatisfied, and an early start can be made for milk collection. The earlier the milk can be delivered to the factory the better from a cheese quality point of view and, also, if the continuity of intake is satisfactory, the manager can arrange the working hours of the assistants to obtain the most efficient service.

With good facilities to assist in a rapid run-off of whey, the operation of firming the curd, wheying off and drying out the curd is a job for two fit adults in order that a satisfactory curd may be produced.

Up to the stage of draining the first vat, it is necessary to have only one man in charge of pasteurizing and setting the vats with an

[Continued on page 417.



DOWNY MILDEW OF LETTUCE

Downy mildew is a disease of lettuce which is most prevalent during the winter and spring months of the year. The disease is caused by a fungal parasite, *Bremia lactucae,* which is capable of attacking any of the above-ground parts of the plant.

The disease commonly appears in the seed-bed, where it spreads very rapidly, particularly when atmospheric humidity is high. Seed-bed losses are seldom serious, however, and growers who are not familiar with the symptoms of this disease may not realize that the lack of vigour and yellowing of their seedlings is the result of an attack by a fungal parasite.

The older leaves of the plant—whether in the seedling stage or approaching maturity—are the first to be attacked. The white or greyish spore producing growth of the fungus is produced on the lower surfaces of the leaves. The affected leaves eventually turn brown, shrivel and die, and the fungus progressively spreads to the new growth.

Mature plants that have been attacked by downy mildew are susceptible to transit rots, as the presence of dead areas of tissue on the lower leaves facilitates the entry of rot-producing organisms. For this reason, it is advisable to strip off the lower affected leaves when lettuce is being prepared for market.

The growing of the Imperial varieties (Imperial D, Imperial F, Imperial 847, Imperial 615, &c.) which were produced in California, provided satisfactory control for this disease prior to the advent of a new strain of the fungus, which rendered all these varieties susceptible.

Until new disease resistant varieties are produced, control measures will not be very satisfactory and growers will have to rely on

Lettuce infected with Downy Mildew.

Cauliflowers showing Whiptail symptoms. Note narrow, crinkled leaves.

Bordeaux spray, which will protect the plants during early seed-bed growth, but is not satisfactory in the field because of the impossibility of covering the undersurfaces of the leaves.

Seedlings should be thoroughly drenched with 4:4:40 Bordeaux mixture during the first week of growth, and again about four days prior to transplanting.

Commercial nurserymen may find it necessary to include an additional application if they are producing lettuce seedlings throughout the year.

WHIPTAIL OF CAULIFLOWERS

Whiptail is a non-parasitic disease of cauliflowers very prevalent on acid soils in this State.

The symptoms of this disease are very characteristic, the affected plants appearing straggly and undernourished when compared with healthy cauliflowers of the same age. The leaves of affected plants are narrow, excessively crinkled, thicker than normal, and brittle. The outer lower leaves are generally the most severely affected. Frequently the lateral roots are reduced both in number and in length. Affected plants do not produce marketable heads.

Whiptail can be controlled by the application of lime to the soil. The amount of lime to apply varies according to the initial acidity of the soil, but where the disease is severe, about $1\frac{1}{2}$ to 2 tons of agricultural lime per acre will be required.

MOTTLE LEAF (Zinc Deficiency) OF CITRUS

The mottle leaf condition of citrus trees has been known for many years and it seems to be present in most of the large citrus-growing areas of the world. In Victoria, it is particularly common in the northern irrigation settlements.

The condition may be readily recognized by the characteristic mottling of the leaves. The normal green colour of the leaf is replaced by a light-yellow, to almost a white colour in the areas between the veins, leaving bands of normal green tissue along the midrib and main veins. The relative amounts of green and yellow vary according to the severity of the disease and in severe cases the entire leaf, except a small area at the base of the midrib, may be reduced to a pale yellow colour. Apart from this effect, the leaves of affected trees are characteristically narrow and pointed. When the disease is severe, a considerable number of twigs die so that the tree gradually becomes reduced in size.

There are no very characteristic fruit symptoms but the fruits are smaller than those from a normal tree, and the yield is greatly reduced.

Control

Although the disease has been known for a long period, its cause was discovered only recently. Plants require numerous elements for their nutrition. Some of these are required in relatively large amounts, but others, such as zinc, are required only in very small quantities. However, if they are not supplied to the plant,

Symptoms of Mottle Leaf of Citrus.

severe symptoms are frequently produced and it has been found that the Mottle Leaf Disease of Citrus is caused by a deficiency of zinc.

In many cases, there is sufficient zinc in the soil, but it has been altered, in the soil, to a form which the plant is unable to absorb. Therefore, the most satisfactory way of correcting zinc deficiency is by spraying the trees with the following mixture:—

Zinc sulphate	..	3 lb.
Hydrated lime	..	1½ lb.
Water ..	..	100 gallons.

If zinc sulphate were added to many of the soils in which mottle leaf develops, the zinc would rapidly be changed to a form which the plant could not absorb and no cure of the disease would result.

THE CURRANT BORER MOTH

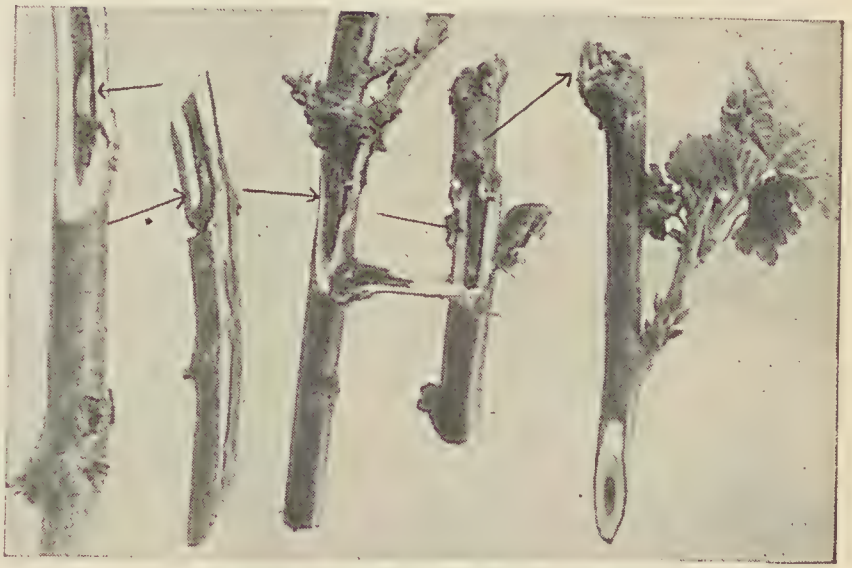
The Currant Borer Moth (*Aegeria tipuliformis* Clerck) is a pest of currants, principally black currants, although both red and white currants are also damaged. Gooseberries and raspberries may also be attacked.

The damage due to the currant borer moth is caused by the larvae or caterpillars boring into young canes and working downwards towards the roots. The plants become sickly with the foliage yellowed and dwarfed and their productiveness is greatly reduced.

The adult moth is about a ½ inch long with a wing spread of approximately ¾ inch. The wings are transparent and the abdomen is black with a purplish sheen and banded with yellow stripes. There is a fan-shaped mass of scales at the hind end of the abdomen. The eggs, which are laid on young wood during October, November, and December, hatch in a fortnight, and the young larvae bore into the pith of the canes and tunnel downward towards the roots. The fully developed creamy-white larva measures approximately ½ inch. There is only one generation each year, the pest overwintering as a nearly full-grown larva inside the cane. In early spring, the larva completes its feeding and tunnels to just below the bark where it pupates. Later, the chrysalis forces itself through the bark and the moth emerges.

Control

No insecticidal control methods are possible for this pest. However, during early spring affected canes can be distinguished by the fact that the new leaves are yellowish and undersized and the canes soon die. Consequently, all canes and twigs which show these symptoms should be cut out at ground level in early spring and the cuttings burned.



Larvae and pupae of Currant Borer Moth.

WOOD BORERS IN HOUSES

Two types of borers cause damage to houses in Victoria, namely, Lyctus, or the Powder Post Borer, and *Anobium,* or the Furniture Borer.

Lyctus, or the Powder Post Beetle. (Enlarged.)

The first-named beetle attacks the sapwood of hardwoods only and consequently the amount of damage that it causes is uually limited to a small proportion of any particular board. The possible exception is in the case of boards of small dimensions, which sometimes contain a large proportion of sapwood.

Lyctus damage can be identified by its presence in hardwood, including eucalypt wood, and by the fact that the tunnels, which usually run parallel to the grain of the wood, are filled with a fine-like dust.

Anobium, or the Furniture Borer, does not attack eucalypt timber and hence is not common in the framework of houses, but is relatively common in furniture. It attacks wood that is thoroughly seasoned and seems to prefer very old wood. The damage caused by this borer can be recognized by the fact that it bores through both sapwood and heart-wood and reduces all to a honeycomb structure filled with a coarse, gritty powder.

Control—Lyctus

Treatment of the wood with creosote, turpentine, or a five per cent. solution of paradichlorobenzene in kerosene, is effective. Creosote stains the wood, but a mixture of one part of creosote to eight parts of kerosene leaves no appreciable stain. Whichever material is used can be brushed or sprayed on to the surface of the affected wood, but the best method is to inject it through the entrance holes by means of a syringe or other suitable instrument.

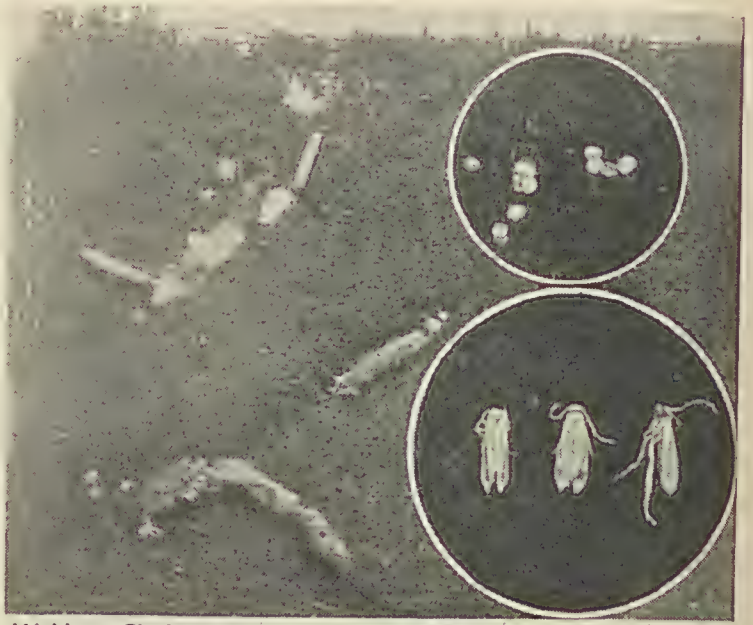
Control—Anobium

Fumigation is the most satisfactory treatment, but it is advisable to have it done by commercial fumigators owing to the poisonous nature of the gases used. If the attack is insufficient to justify this expense, injection of one of the materials recommended for Lyctus will be effective.

CLOTHES MOTHS

There are two species of clothes moths commonly found in factories, warehouses, and houses where wool, feathers, hair and fur or goods manufactured from these substances are stored. The Webbing Clothes Moth (*Tineola biselliella*) is so called because its larvae tend to form an unsightly web of silken threads and irregular tubes and tunnels on infested fabrics. The larvae of the Casemaking Clothes Moth (*Tinea pellionella*), however, spin portable cases of silk to which are stuck portions of the material upon which they are feeding.

The eggs, which are laid on or in the meshes of fabrics, hatch in approximately 7 to 10 days. The larvae, the destructive stage of these pests, feed on the fabric and when fully fed measure approximately ½ inch. The adult moths have a wing spread of about ½ inch, but are frequently unnoticed because of their avoidance of bright light.



Webbing Clothes Moth.—Eggs (enlarged) in upper circle; moths in lower circle; caterpillars and larval shelters on cloth.—All somewhat enlarged. [After *Gibson and Twinn.*

Control

Fabrics and materials subject to attack should not be stored for long periods undisturbed unless adequate preventive measures are taken. This should take the form of storing fabrics in tight cupboards and chests together with naphthalene or paradichlorobenzene at the rate of 1 lb. to 8 cubic feet. Clothing in wardrobes should receive a thorough brushing and airing periodically. Infested carpets and furniture should receive a thorough spraying with fly spray followed by brushing, and where possible the use of a vacuum cleaner.

Where severe infestations have developed, fumigation of either the infested articles or rooms and buildings may become necessary. For this purpose, fumigants such as hydrocyanic acid or carbon bisulphide are normally used. These, however, are best handled by experts conversant with the hazards involved in their use.

Sowing Down of Pastures

Pastures consisting of the better types of introduced species can be established by sowing the seed either in the autumn or spring. Autumn sowing is preferable, as the seedlings can get their roots well down during the winter months and there is less chance of competition by weeds, but the degree of preparation of the ground has a big influence on the success.

The amount of preparation depends on the type of sward desired and the species to be sown. If it is desired merely to establish subterranean clover amongst the native species on an area a certain amount of success can be obtained simply by mixing the seed with the superphosphate which is to be applied, and top-dressing immediately without any preliminary preparation at all, but, with this method, a big percentage of the seeds fail to take root, and it may be several years before the subterranean clover becomes a prominent constituent of the sward.

Better results are obtained by using a drill or by harrowing the area before and after the seed is broadcast, thus burying the greater part of the seed, and the effect of opening up the natural sward somewhat gives the young seedlings a chance to survive.

To obtain the best results when a mixture is to be sown, the area should be ploughed up and left to fallow for a season or cropped for a year or two in order to eliminate weeds, after which the seed is sown in the usual way.

However, it is important to allow the soil to become well compacted after a fallow period to obtain a firm seed bed which is not so likely to dry out on the surface as a loose soil, should there be a hot spell of weather after sowing, and the roots can get a foothold.

[Contributed by the Agricultural Division.]

CHEESE INDUSTRY EXPANSION—*(continued from page 412).*

assistant coming on in time to assist in cutting and cooking. The balance of the team can then come on at the time to whey off the first vat; one man commences wheying off while the others take out cheese from the hoops and follow on with the other vats as they become ready for attention.

For smooth working, the cheesemaker must be capable of studying milk conditions and of maintaining a normal rate of acid development from day to day. This involves special attention to the care of starters. Generally speaking, there was little trouble with starters during the past season; but in some factories carelessness in handling them resulted in slow vats and off flavours. Slow acid development, of course, results in avoidable overtime.

The pasteurizer must have sufficient capacity to cope with the rate of milk intake. It naturally follows that steam for heating and water for cooling must be available. There should be as little delay as possible between receipt of the milk and its delivery into the vats. It is not desirable to have the vats set at more frequent intervals than 20 minutes, otherwise too many assistants are required on the job at the operations from wheying off.

With due consideration to these various aspects of cheese manufacture, it is possible for the factories concerned to conduct their operations with a minimum of labour and a maximum of efficiency.

KITCHEN NOTES

Some Soup Recipes

By RACHEL M. PEILE, Fruit Preserving Expert

SOUPS are always a popular item on the menu, especially in the cold winter months. They may be made economically from various ingredients with which vegetable water, left-over gravies, and cooked vegetables may be included.

Soup should be of good flavour, free of fat, and not seasoned to excess. It is most appreciated when served very hot.

Thick soup such as vegetable broth, mutton broth or artichoke soup could be served as a main course, with a meat or sweet course to complete the meal. When this is done, meat and vegetables or vegetables and milk should be included in the ingredients.

Fresh young vegetable peelings such as carrot, parsnip, turnip, potato, artichoke, &c., are excellent both for flavour and food value.

It is advisable not to peel young root vegetables, which should be well washed and the whole vegetable used.

The dark outside leaves of cabbage and silver beet, which contain large amounts of minerals should not be discarded. When thinly shredded they add richness to a green vegetable soup.

Dried peas, string beans, root vegetables, and pumpkin may be used in place of fresh vegetables. The dried vegetables should be soaked overnight. Smaller quantities of dried vegetables are required than fresh, as they recover their natural bulk when soaked.

When meat stocks are used the maximum nourishment and flavour are obtained when bones are chopped fairly small and the meat cut into squares. Rabbit bones make a good stock for soups, and fish bones and heads are excellent for making fish soups.

To make Stock.—Place ingredients in cold salted water and bring to boil slowly. Allow to simmer for 1½ to 2 hours, then strain.

Milk soups and purees are excellent, especially for children, as they contain milk in addition to the vegetables. Powdered full-cream milk may be used in place of fresh.

Whenever a thickening is required, oatmeal, either plain or flaked, should be used instead of flour, but in this case the soup will take a little longer to cook than if flour is used.

The addition of a little sugar to all soups will bring out the flavour (quantity: 1 level dessertspoonful to 1 quart of soup).

A little curry powder will help to improve the flavour of soup which tastes rather flat.

Parsley, which can be grown easily, is rich in vitamin C and iron. It should be chopped and added to meat soups as a garnish.

Vegetable Soups

Some recipes for various nutritious soups are given hereunder:—

CARROT SOUP. (Approx. 4 Servings.)

1 lb. carrots.
½ lb. onions.
1 oz. butter or good beef dripping.
1 oz. flour or ½ oz. oatmeal.
1 pint milk.
1 pint boiling water, salt, sugar, cayenne.

Method.—Cut the carrots and onions into dice and fry in the butter for 5 minutes. Add the water, cook until the vegetables are tender. Rub through a sieve. Blend flour with a little of the milk, add the rest of the milk to the carrot and boil. When boiling, add flour and cook for 10 minutes. Season and serve with chopped parsley.

GREEN PEA SOUP. (Approx. 6 Servings.)

1 lb. green peas.
1 pint milk.
2 tablespoons flour or oatmeal.
1 small onion.
1 tablespoon butter.
1 dessertspoon sugar.
Salt.

Method.—Wash the peas and cook with the onion until soft; press through a colander and return to liquid. Make a white sauce of the butter, flour, and milk and add to mashed peas. Add salt and sugar and cook for 5 minutes. Sprinkle with chopped mint. A little cayenne or dash of nutmeg adds to the flavour.

Lettuce Soup. (Approx. 6 Servings.)

Two lettuces.
½ cucumber.
2 sprigs tarragon.
1 sprig parsley.
½ oz. butter.
½ cup of cream (or whole cream milk).
2 yolks of eggs.
1 qt. stock or water.

N.B.—The outside leaves only of the lettuces may be used. Outside leaves of cabbage, silver beet, or spinach may be substituted for lettuce.

Method.—Shred the lettuces, cucumber, and herbs, and cook for about 5 minutes in the butter, but do not let them brown. Put them into the hot stock and cook till tender. Skim and when cool stir in beaten egg yolks and cream or milk. Let the soup stand on side of stove till thoroughly hot. Do not allow to boil.

"Quick" Tomato Soup.

To 1 cup of tomato sauce add 1 cup of vegetable water, ¾ cup of milk, small lump of butter, little salt, and sprig of parsley. Bring almost to the boil and stir all the time. The mixture must not boil. Add chopped parsley as garnish.

Vegetable Broth. (6 Servings.)

1 cabbage.
1 carrot (sliced).
Celery, 2 stalks.
¼ lb. dripping.
2 onions.
1 turnip.
½ cup barley.
½ cup butter beans.
1 dessertspoon sugar.
Water or stock to cover.

Method.—Melt fat in pan. Add shredded cabbage and cook gently, add other vegetables and flavourings and cook till all vegetables are tender. Serve very hot.

Cream of Potato Soup. (4 Servings.)

3 medium-sized potatoes.
1 small onion.
1½ pints milk.
1 small turnip.
Salt, pepper, parsley.
1 blade of mace.

Method.—Peel potatoes, onion, and turnip. Slice, and cook until soft with a little salt in sufficient water to cover. Press through colander. Add milk, reheat and add flavourings and chopped parsley.

Cream of Artichoke Soup. (4 Servings.)

6 artichokes.
2 small onions.
1 tablespoon butter or dripping.
1 pint stock.
1 pint milk.
Parsley.

Method.—Wash and peel artichokes. Put them into a basin of cold water mixed with the juice of a lemon to prevent them from discolouring. When all are prepared, peel and slice onions. Melt butter in a saucepan, add onion and drained artichokes. Cook for 5 or 6 minutes, turning constantly to prevent browning. Add stock and parsley. Cover and simmer until artichokes are tender. Rub through a hair sieve and place puree in saucepan. Heat and stir in milk. If artichokes are small, use less milk or thicken to taste with cornflour dissolved in a little cold milk. If liked very creamy, add a little cornflour dissolved in milk, no matter the quantity of artichokes. If adding cornflour, bring to boil before serving, otherwise only reheat.

Lentil Soup. (4 Servings.)

2 cups lentils.
2 small onions.
1 tablespoon dripping.
3 pints cold water.
1 carrot.
1 turnip.
Chopped mint.

Method.—Soak lentils overnight. Chop onions finely and cook without browning in the melted dripping. Pour in lentils, cover with the water, add a pinch of salt and pepper. Simmer slowly for 2 hours, rub through sieve, return to saucepan, add the carrot and turnip, grated, boil half an hour or longer, and just before serving, add chopped mint.

Oatmeal and Mushroom Soup. (6 Servings.)

2 tablespoons butter or beef dripping.
1 medium onion.
½ cup plain oatmeal.
1 pint milk.
1 cup mushrooms.
1 dessertspoon sugar.
1 quart water.
Salt.

Method.—Peel onion and chop finely. Cook in butter for 15 minutes. Add water and boil, then add oatmeal. Boil gently for 10 minutes. Rub through colander and add the milk. When thoroughly heated, add the chopped mushrooms and salt. The mushrooms are sometimes improved in flavour by boiling for a few minutes beforehand.

PUMPKIN SOUP. (4 Servings.)

1 lb. pumpkin.
Piece of onion, turnip, carrot, celery.
2 level tablespoons plain oatmeal.
1 quart water.
1 cup milk.
Salt, sugar, cayenne pepper.

Method.—Prepare vegetables and cut up roughly. Put into saucepan with the stock or water. Bring to boil and simmer gently till tender (about 40 minutes). Rub through sieve, or coarse strainer. Return all to saucepan. Blend oatmeal with a little cold water, add to soup and stir till boiling. Cook 6 minutes longer. Add milk and reheat without boiling. Garnish with a few cooked peas, or a little raw grated carrot.

NOTE.—Any mixture of vegetables may be used in this method, provided the proportions are adhered to.

Meat Soups

MUTTON BROTH. (6 Servings.)

3 lb. neck mutton.
2 quarts water.
1 carrot.
½ turnip.
1 stalk celery.
1 onion.
3 oz. barley.
Salt, pepper.
Chopped parsley.

N.B.—Oatmeal may be substituted for barley.

Method.—Joint the mutton, but do not divide it. Put it into a saucepan with the barley (which should have been soaking in cold water for 2 or 3 hours), pour over the water, and simmer gently for 2½ hours, taking off the scum as it rises; then add the salt, cut the vegetables into neat strips, and simmer with the mutton for another hour. Take off the fat, add the parsley and serve. The mutton can be served with caper or parsley sauce as a luncheon dish.

MULLIGATAWNY SOUP. (6 Servings.)

2 quarts stock or water.
1 apple.
1 onion.
½ oz. plain oatmeal.
1 oz. butter.
1 dessertspoon sugar.
Boiled rice for garnish.

(Rycena may be used as rice substitute.)

Method.—Slice apple and onion and fry them in the butter. Sprinkle over the curry powder and flour, and brown also; pour over the boiling stock, and stir till the mixture boils again. Simmer gently for 1½ hours; rub through a sieve, return to the saucepan and bring to boiling point. Squeeze in the juice of half a lemon. Serve with boiled rice.

RABBIT SOUP. (8 Servings.)

1 large rabbit.
1 lb. pickled pork or bacon (bacon or ham bone may be used).
4 onions.
1 turnip.
1 tablespoon oatmeal.
5 pints water.

Method.—Put pork, 2 onions and turnip in 2 quarts of hot water, and simmer for 1 hour. Wash rabbit, and add to it one pint of cold water, and simmer for another hour. Then remove rabbit and pork, cut off as much meat as possible, and put bones back (the meat may be used for a stew). Fry remaining 2 onions (cut in slices) till they are brown and put in broth. Simmer 2 hours, occasionally skimming surface. Thicken with oatmeal mixed to a paste, add salt, if not salty, to taste. Strain and serve hot.

N.B.—If oatmeal is used in place of flour for thickening soup, add when the stock and vegetables come to the boil, as it takes longer to cook than flour.

MAKE HAY WHILE THE SUN SHINES

CONSERVED FODDER MAY BE URGENTLY NEEDED NEXT WINTER

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Number of Birds.
Abernethy, F. J. L., Horsham	445
Abikhair and Tracey, Heidelberg	595
Aitken, J., Silver-street, Cheltenham	900
Archard, K. F., Yeoburn East	126
Armstrong, D. M., Campbell's Creek	178
Bantick, H. M., Heatherton	276
Barber, Mrs. M. E., Lower Ferntree Gully	109
Barnes, A., Blackburn	1,972
Bartlett, E., Pimpinio	273
Batey, R. F., Invergordon S.	802
Becker, F. W., Cheltenham	293
Bentley, F. W., Frankston	592
Berry, R., Campbell's Creek	57
Bethell, R. A. B., Lower Templestowe	745
Blyth Bros., Bayswater	97
Cakebread, H., Shady Creek, via Warragul	225
Christie, R. R., and Son, Bentleigh	728
Clark, H. N., Croydon	2,011
Clarke, F. W., Stonehaven, via Geelong	82
Clegg, R. M., Hamilton	31
Coats, C. J., Donald	63
Coles, W. R., Croydon	79
Counsel, A., Wantirna	248
Coupar, J. E., Nathalia	458
Cox, F. S., and C. P. West, Cheltenham	223
Davidson, Mrs. W., Ringwood	103
Davis, Wm., New Gisborne	28
Dawson, L. J., Eversley	110
Dawson, Mrs. D. M., Castlemaine	384
Dimoline, W., Noble Park	358
Donald, Alex., New Gisborne	405
Dookie Agricultural College, Dookie	614
Eastaugh, T. L., Highett	448
Eastman, L. H., Pascoe Vale	764
Evans, Mrs. R., Kyneton	101
Everard, H., Hawkesdale	382
Fry, J. L., Alphington	166
Gartner, Miss M. T., Box Hill	119
Giovanetti, R. M., Kennington, Bendigo	24
Godfrey, Mrs. M. A., Healesville	271
Greenshields, E. J., Lancefield	221
Gregson, R., Ky Valley	272
Grenville, G. W., Spring Vale South	2,180
Gwyther, R. P., Highton	294
Hamilton, A., Flinders	995
Hayes, R., Montrose	143
Heath, A. L., Westall-road, Springvale	301
Hemphill, A. E., Monegetta	441
Henderson, C. W., Shepparton East	367
Hill, A. E., Balwyn	76
Hines Bros., Traynor's Lagoon	1,300
Hockley, N., Hamilton	48
Hopkins, C. A., Shepparton	1,260
Holdsworth, A. W., Jung	828
Horsfall, J. B., Lower Templestowe	825
Hunt, R. R., Burwood	462
Jackson, C. and H., Carrum Downs	140
Johnson, A. S., Lower Ferntree Gully	567
Jolly, W., Five Ways P.O.	249
Jones, M. A., Ringwood	362
Kenneally, Wm., Hampton Park, via Dandenong	170
Kidgell, L. L., Ringwood	331
King, J. J., New Gisborne	48
Kosch, E. W., Coromby	389
Kostos, D., Oakleigh	769

Owner.	Number of Birds.
Lennie, Mrs. J. E., Mt. Scobie, via Kyabram	88
Lowe, L. S., Bayswater	175
Lucas, Geo., Blackburn	377
McCabe, R., Dandenong	1,447
McDonald, R. A., Moyston	114
McKay, D., Pascoe Vale	750
Mackintosh, W. C., Neerim South	613
McLaughlin, K. A., Bayswater	730
McLeod, Miss K. M., Digger's Rest	196
McNamara, Owen J., Ringwood	846
Maher, A. E., Wal Wal	987
Mair, W. P., Tyabb	91
Major, W. R., Girgarre	75
Massie, G., Shepparton	1,402
Mead, J. L., Oakleigh	81
Meaklim, R., Mooroopna	89
Molson, W. E., Blackburn	599
Moore, H. A., Ringwood North	321
Mulconry, H., Noble Park	70
Mumford, L. J., Healesville	395
Mynott, J. B., Eltham	25
Nemet, P., Springvale	797
Newparth, F. C., Croydon North	104
Nichols, Mrs. E. M., Yan Yean	481
Nichols, W. G., Wandong	115
Pearse, Mrs. H. F., Donald	279
Peel, C. W., Gnarwarre	360
Penn, Mrs. C., Beaumaris	527
Poole, A. T., Mooroolbark	319
Poulton, A. W., Sebastopol	255
Rae, John, Sebastopol	1,736
Reformatory Prison, Castlemaine	299
Ridge and Son, Blackburn	682
Ridgway, G., Noble Park	143
Rogers, S., Dandenong	883
Rushton, J. A., Shepparton	772
Salathiel, C. P., Bendigo	514
San Miguel, Mrs. M. H., Box Hill	2,317
Sanders, A., Wantirna	367
Shipp, R., P.B., Kerang	454
Simpson, G. D., Glen Waverley	695
Skinner, Miss M. F., Noble Park	81
Smith, E., Highton	211
State Research Farm, Werribee	371
Stephenson, Mrs. K., Research	311
Stewart, J. A., Castlemaine	653
Stiles Bros., Wallan	795
Sutherland, J. M., Box Hill	899
Sweeney, J., Ararat	238
Taylor, E. D., Sebastopol	2,002
Thomas, C. H., Burwood	219
Throup, N. C., Neerim South	31
Throup, R. E., Neerim South	199
Trinca, M., East Oakleigh	1,328
U'Ren, B. W., Mt. Waverley	128
Vogt, E. G., Mentone	165
Waldmann, F., North Balwyn, E.9	1,147
Walker, Mrs. E. H., Lancefield	126
Webb, A. E. H., Cranbourne	2,306
White, B. J., Glen Waverley	541
Williams, V., Wangaratta	448
Wimhurst, J. C., Tongala	398
Winter, G., Murgheboluc	293
Wohlers, Stanley, Jung	199
Youl, R. S., Wedderburn	817

A GOOD HAY-STACK THE BEST INSURANCE AGAINST SHORTAGE

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East ..	154
Ballarat Orphanage ..	Ballarat	135	Northcote Children's Farm	Bacchus Marsh ..	156
Banyule Stud Pty. Ltd.	Wangaratta ..	31	Onley, W. H. ..	"Glenholme," Caldermeade	55
Black, I. S., Estate ..	Mount Noorat ..	53	Payne, A. E. T. ..	"Yarra View," Lilydale	63
Clarke, A. B. ..	Glenormiston South	15	Payne, T. E. N. ..	"Woodburn," Kilmore	46
Dennis, Mrs. A. A. ..	Frankston ..	33	Poole, M. A. and D.	Caldermeade ..	134
Dookie Agricultural College	Dookie	85	Poole, M. A. and D.	Yannathan ..	72
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Powell, T. S. ..	"Carellen," Mansfield	46
Geelong Grammar School	Corio	68	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gibson, Mrs. C. S. ..	"Sweeney's" Eltham	35	Samuel, Misses G. and E.	Lang Lang ..	48
Gorman, A. W. ..	"Cathcart," Alexandra	61	School of Horticulture	Burnley	10
Hollaway, R. W. ..	Caldermeade ..	75	State Experiment Farm	Rutherglen ..	40
Kilmany Park Farm Home for Boys	Sale	104	State Research Farm	Werribee	229
Lawrence, P. H. ..	"Rainga," Tarrawarra	72	Tanner, N. J. ..	Pakenham ..	33
Longerenong Agricultural College	Dooen	43	Vagg, T. E.	Officedale ..	45
			Wells, W. G. ..	Caldermeade ..	63

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Anderson, J. B. .	Warrnambool ..	19	Bunting, J. ..	Epping	35
Andison, J. A. ..	Thomastown ..	46	Burke, T. S. ..	Huntly	19
Andrew, J. C. ..	Whittlesea ..	78	Butler, W. ..	Wallan	49
Andrew, W. ..	Whittlesea ..	160	Callaghan, L. ..	Epping	34
Andrews, E. H. ..	Templestowe ..	19	Carr, W. J. ..	Wollert	65
Barclay, A. H. ..	Whittlesea ..	107	Cavagna, Miss ..	Sedwick	7
Barker, Mrs. E. M. ..	Huntly	11	Child, G. P. ..	Epping	53
Bates D. S. ..	Whittlesea North ..	25	Christian Bros. ..	Doreen	42
Batten, R. J. ..	Wollert	44	Clark, P. W. ..	Whittlesea ..	62
Benson, R. ..	South Morang ..	35	Collins, L.	Doreen	48
Bodycoat, A. ..	Wollert	39	Cornfoot, D. H. ..	Whittlesea ..	43
Booth, Mrs. A. ..	Warrandyte ..	7	Coulthard, J. J. ..	Whittlesea ..	76
Bourke, G. J. ..	Fairfield	82	Crack, Mrs. E. ..	Bendigo	12
Bourke, J. W. ..	Somerton	37	Craker, Mrs. E. ..	Warrandyte ..	2
Bradbury, A. K. ..	Diamond Creek ..	50	Crowle, A. J. ..	California Gully ..	16
Bradbury, G. ..	Kangaroo Flat ..	20	Cumming, H. R. ..	South Morang ..	23
Brereton, E. ..	Kennington ..	25	Cunningham, E. C. ..	Templestowe ..	23
Browell, L. ..	Golden Square ..	15	Cupris, A.	Bullock Creek ..	31
Brown, Mrs. A. ..	Maiden Gully ..	11	Danaher, J. V. ..	Whittlesea ..	70
Brown, R.	Kennington ..	4	Danns, N. C. ..	Whittlesea ..	34
Brownhill, C. E. H. ..	Bundoora	34	Deutscher, H. W. ..	Mernda	168
Bryden, A. C. ..	Bendigo	17	Doggett, T. ..	Kangaroo Flat ..	17

Name.	Address.	Number in Herd at Last Test.
Dillon, L. W.	Epsom	18
Draper, L. S.	Wollert	31
Drysdale, J. C.	Warrandyte	41
Dunstan, W.	Pascoe Vale	32
Elliott, W.	Elmore	62
Faderson, J. H.	Mandurang	108
Fergusson, M. A.	Whittlesea	92
Fitzpatrick, W.	Mandurang	9
Fitzsimons, B.	Lower Templestowe	33
Flanagan, A. D.	Epsom	10
Flynn, O.	Epsom	21
Fox, A.	Mernda	59
Friswell, H.	Bendigo	42
Galbraith and Walker	Greensborough	36
Gallagher, J.	Golden Square	20
Gallus, E. A.	Doncaster	14
Gamble Bros.	Greenvale	156
Gardiner, A. M., Estate of	Whittlesea	91
Gardiner, C. E.	Epping	20
Gentner, H.	Eaglehawk	9
Gibbs, C.	Arthur's Creek	30
Gindice, J. J.	Kangaroo Flat	17
Goulden, J. B.	Wilson's Reef	54
Graff, Mrs. M. G.	Mernda	24
Graham Bros.	Whittlesea	71
Green, J.	Eppalock	15
Green, W.	Mernda	11
Gunn, W.	Kangaroo Flat	10
Hall, Mrs. J. E.	Whittlesea North	13
Hamilton Bros.	Huntly	17
Hancorne, Miss M. R.	Yan Yean	34
Hargreaves, W.	Emu Creek	10
Hawkes, Miss D.	Warrandyte	21
Hehr, R.	Wollert	23
Henshaw, Miss A.	Templestowe	16
Herd, J.	Epping	46
Hewitt, C. J.	Wattle Glen	8
Higgs, R. N.	Yan Yean	76
Hobbs, Mrs. F. J.	Doncaster East	5
Houlahan, P.	Eppalock	40
Houlahan, T. J.	Eppalock	43
Howell, G. G.	Wollert	221
Hoy, T.	Kennington	26
Jackson, Mrs. M. A.	Heidelberg	11
Jackson, Mrs. M.	South Warrnambool	6
Janefield Farm	Bundoora	43
Jenkins, T. H.	Whittlesea	24
Johnstone, Miss J. A.	Mernda	14
Jones, A. J.	South Morang	30
Jones, S. E.	Campbellfield	23
Jones, S. G.	Epsom	13
Jukes, C.	Epping	39
Jukes, W. H.	South Morang	28
Junor, G. M.	South Morang	56
Kell, W. E.	Greensborough	28
Kerr, J.	Mandurang	7
Kerwin, H. E.	Eaglehawk	21
Kilpatrick, E.	Mernda	89
Kirkwood, S.	Eaglehawk	12
Knight Bros.	White Hills	42
Lane, J.	Warrnambool	9
Latta, Mrs. J.	Warrnambool	6
Lawry Bros.	Tandara	113
Lehmann, A. H.	Epping	36
Lethlean, S. J.	Epping	27
Levett, E.	Warrnambool	12
Love, J. E.	Strathfieldsaye	16
McCormack, D.	Woodstock	59
McCulloch, A. A.	Warrnambool	28
McDowell, R. H.	Greensborough	26
McGregor, W. B.	Mernda	41
McKay, J. M.	Wallan	62
McKay, L.	Kal Kallo	12
McKendry, J.	Doreen	47
McKenzie, D. I.	Marong	95
McKernan, A. H.	Whittlesea	24
McKie, J. W.	Wollert	83
McLean, J. F.	Bundoora	32
McPhee, K.	Whittlesea	116
McPherson, A.	Yan Yean	64
Maltzahn, Mrs. E. N.	Campbellfield	45
Mannes, W.	Strathfieldsaye	39
Mason, N.	Donnybrook	52
Maxwell J.	Whittlesea	32
Mays, Mrs. A. M.	Doncaster	6
Melling, T.	Kennington	16
Mercer, H.	Long Gully	18
Miller, A. J.	Whittlesea North	47
Miller Bros.	Greensborough	44
Miller, D.	Epping	42
Morris, E. J.	Huntly	19
Mosig, H. C.	Epping	26
Murfet, Mrs. S.	Huntly	21
Nalder, H. S.	Epping	20
Nankervis, L.	Mandurang	15
Nash, H. A.	Tullamarine	41
Nebel, Mrs. A. E.	Thomastown	36
Nickols Bros.	Tandara	72
Noonan, J.	Sedgwick	50
O'Hern, T.	Epping	58
O'Keefe, J. P.	Warrnambool	21
Parker, Mrs. A. E.	Greensborough	24
Parker, R. H.	Craigieburn	91
Patullo, F. E.	Mickleham	36
Pearce, A. E.	Mandurang	55
Pearce, J.	Mandurang	24
Pentland, E.	Maiden Gully	8
Pentland, F. C.	Marong	26
Pilcher, W.	Kangaroo Flat	13
Pitson, R. H.	Yarrambat	19
Portingale, J.	Campbellfield	42
Power, L. J.	Mernda	52
Quinlan Bros.	Epping	48
Rawlings, J. H.	Whittlesea North	31
Rodgers, E.	Whittlesea North	14
Rosewarne, Miss P.	Yan Yean	49
Rowe, Mrs. M.	Eaglehawk	19
Ruff, A.	White Hills	12
Salathiel, R. W.	Big Hill	14
Salau, E.	Strathfieldsaye	12
Scheuffele, C.	Epsom	24
Seeber, B.	Thomastown	28
Semmens, J. H.	Sedgwick	18
Shaw-Logan T.	Glenroy	103
Sheahan, J.	Templestowe	30
Sheeky, A. A.	Templestowe	24
Short, E.	East Preston	99
Siebel, F.	Thomastown	29
Smirfitt, J. E.	Epping	39

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Smith, H. H. ..	Heidelberg ..	33	Underwood, N. ..	Alphington ..	13
Smith, J. R. ..	Mernda	34	Vallence, C. A. ..	Epping	19
Smith, L. W. W. ..	Bundoora	81	Van, E. L. ..	Templestowe ..	25
Smith, M. ..	Heidelberg ..	43	Wheeler, W. A. ..	South Morang ..	34
Smith, R. A. ..	Epping	26	Whelpton, B. ..	Whittlesea North ..	59
Smith, S. E. ..	Epping	33	White, W.	Greensborough ..	17
Somerville, A. ..	Strathfieldsaye ..	15	Whitelock, E. A. and E. J.	Epsom	23
Somerville, J. ..	Strathfieldsaye ..	14	Whitfield, A. E. ..	Bendigo	6
Somerville, M. ..	Strathfieldsaye ..	15	Whittingham, E. W.	Greensborough ..	41
Somerville, P. ..	Strathfieldsaye ..	23	Wicks, C.	Golden Square ..	18
Somerville, W. ..	Strathfieldsaye ..	48	Williams, E. A. ..	Thomastown ..	32
Southon, H. W. ..	South Morang ..	60	Williams and Berryman	Bendigo	15
Spruzen, G. ..	Wollert	41	Williamson, J. ..	Doncaster (High-st.)	4
Stephens, H. ..	Epping	53	Willis Bros. ..	Craigieburn ..	61
Stimson, T. ..	Woodstock ..	33	Wilson, J. E. ..	Diamond Creek ..	9
Story, A. E. ..	Emu Creek ..	36	Wilson, Mrs. M. ..	South Morang ..	14
Story, T.	Mandurang ..	24	Wooster, G. S. ..	Watsonia ..	23
Thomas, Mrs. E. ..	Broadmeadows ..	11	Wrest, W.	Epping	77
Thomas, Mrs. V. E.	Yan Yean ..	31	Wuchatsch, J. D. ..	Epping	17
Toman, Mrs. A. ..	Golden Square ..	15	Yann, R.	Wollert	52
Towt, C. W. ..	Glenvale	136	Young, G. T. ..	Sedgwick	63
Trahair, R. ..	Maiden Gully ..	49	Young, J. A. ..	Sedgwick	39
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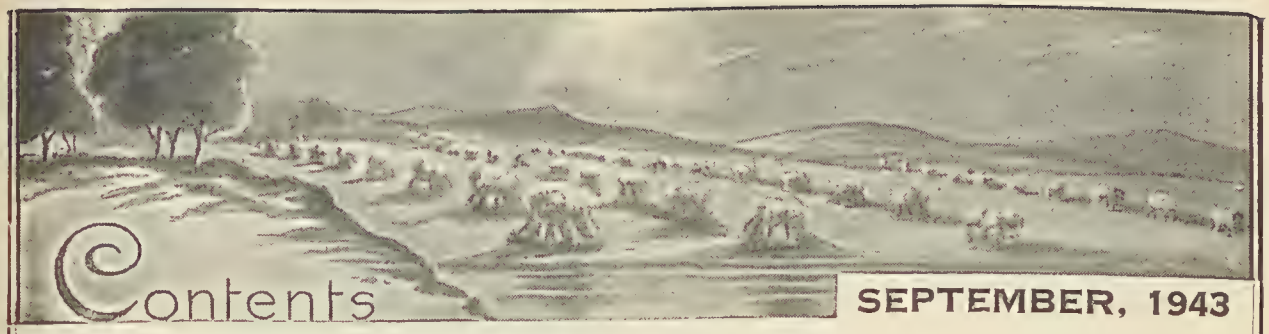
There are also 742 herds in which 14,588 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

Supplementary List of Licensed Skin Buyers

Sheep Owners Protection Act

Following is a supplementary list of persons licensed under the Sheep Owners Protection Act to buy raw sheep skins. The licences have effect until the 31st December, 1943.

Licence Number.	Holder of Licence.	Address.
1739	Cameron, R. J. D.	Buchan
1748	Einseidel, E. B.	8 Yendon-road, Glenhuntly
1740	Gadd, M. C.	Walwa
1751	Heddle, R. M.	4 Wellington-street, Kerang
1742	Hould, R. J.	Byrne-street, Stawell
1747	McClintock, A. E.	Bowen-street, Digby
1743	Penny, H.	422 Ascot-street, Ballarat
1752	Pickthall, J. W.	St. Arnaud
1745	Robertson, C. N.	9 Little Provost-street, North Melbourne
1741	Ross, J. A.	Walwa
1750	Sly, C.	Walpeup
1744	Tellie, N.	Rosebery P.O.
1749	Thomas, S. S.	Corner Wattle and Victoria streets, Bendigo
1746	Young, W. J.	Cumming-avenue, Birchip



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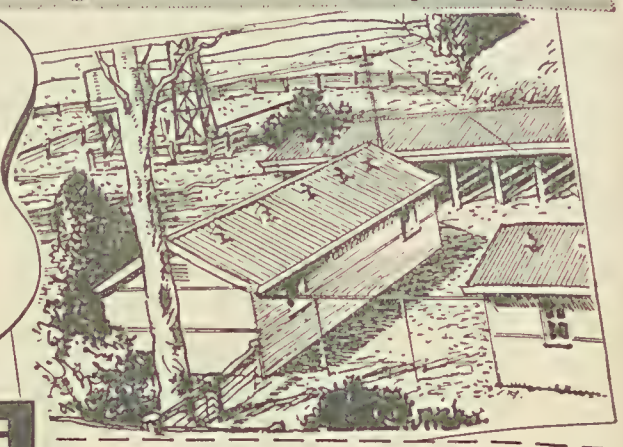

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STANDARD HERD TEST

REPORT FOR YEAR 1942-43

By D. R. McKENZIE, Senior Dairy Supervisor

Dr. A. R. Haywood's Reserve Champion Jersey herd which averaged 502 lb. butterfat.

THE yields recorded in the Standard Herd Test during the year 1942-43 have been particularly good and, on the whole, show substantial progress. True, the early part of the year was a favorable one for heavy pasture growth in all grazing centres, although top-dressing activities had been curtailed by the shortage of superphosphate. The latter part of the year, however, was unusually dry and reflected unfavorably on the yields of the cows which completed their tests in this lean period. It has, perhaps, been one of the most difficult years for dairying since the inception of the test, due to the fact that many farmers' sons and daughters have joined the services and to the general all-round scarcity of labour. In addition, the restricted supply of concentrates has affected the year's average production.

Despite the drain on manpower occasioned by the war, it is notable that there has been no overall decrease in this year's figures as compared with last. As partly explaining this, productivity was on a rising tide for some years before the war, and this factor no doubt has stood to us during these last few years.

The growing pressure of the farm labour problem must henceforth inexorably exert a depressing influence on productive capacity, as must the curtailment of pasture top-dressing arising from shortage of superphosphate. Even so, the writer is of opinion that these factors have had little effect during the season under review; but in the seasons to follow their influence must become more apparent.

The productive ability of a cow can be ascertained only by testing. The figures obtained indicate her ability as a producer under the existing feeding and management conditions. There is ample evidence available to show that the average herd contains animals which do not produce sufficient butterfat to pay for the food they consume.

It should be understood that herd test figures merely disclose the cow's capacity to convert fodder into butterfat. It is for the farmer to see that she gets the fodder, and this not one day in the year, but every day. Culling also is important, and a farmer who neglects to cull unprofitable animals has only himself to blame if the herd's production is stationary or shows a decrease.

Every breeder who expects to obtain a progressive increase of butterfat through the influence of a selected bull will form his judgment of the bull by the returns of the heifers. This is quite a natural procedure,

"Yarraview Rougette," senior 3-year-old Guernsey, owned by Capt. A. E. T. Payne, produced 778 lb. butterfat.

because it is to any herd owner's interest to prove the success or failure of his selected sire as early as possible.

There are, however, other features in a bull's female progeny which should be checked for as well as the butterfat yield. They include the shape, structure, and attachment of the udder, and the size, structure, and the placing of the teats. To the breeder of any class of dairy cattle, pure-bred or otherwise, these points are important. No matter what the butterfat production of his daughters, it is wrong to include in a list of successful sires, any bull whose daughters have such undesirable characteristics as spindly, small, or thin teats, ill-attached udders, are "tough" to milk, or have any visible physical defect. Cows may have all these physical imperfections and yet be heavy butterfat producers, just as they may be physically perfect and yet disappointing producers.

Some may contend that when milking machines are in general use the size, shape, placement, and constitution of the teats will all be less important than with hand milking. This view, however, is only partly true, if true at all, for even milking machines work better on well-formed teats and udders.

The average butterfat production of all cows in Victoria, as estimated by the Government Statist for the year ended 30th June, 1942, was 200 lb. This is the highest yield ever recorded, and the increase is no doubt largely due to herd testing, which has stimulated the use of good quality dairy bulls and better feeding.

Some bulls have been known to increase the average production of their daughters by as much as 100 lb. of butterfat over that of the said daughters' dams. The sire, then, is a most important factor in the herd if producing animals are to be furnished.

A poor sire, on the other hand, may ruin the future of an already well-established and high-producing herd. A careful study of the records of his ancestors will provide a reasonably accurate indication of what may be expected from a particular sire. There may be some individuals that fail to breed as true to their parents' utility character as they do to the parental breed type, but the great majority follow in producing ability as well as physical appearance.

During the year under review, 75 herd entries had unfortunately to be refused through shortage of staff. This must reflect on production, which is regrettable when every pound of dairy produce is so urgently required.

Bulls play an important part in the successful development of production, and unless their daughters are tested, breeders cannot know the proven begetters of high-yielding stock. Another matter that gives food for thought is the slaughter of heifer calves, which, unless done with due discrimination, must have a serious effect on our future dairy herds. An endeavour should be made by every dairy farmer making his living by butterfat to rear at least 25 per cent. of heifer calves from his best cows.

It is pleasing to see that many breeders are becoming increasingly ready to test their herds, realizing no doubt that dairymen now want to know what any particular breed can do in production, for it is the result in the bucket that counts when it comes to the real purpose of dairy farming.

There will be a big demand for dairy stock when the war is over, and it behoves the breeders to do what they can to maintain production along with serviceable type to supply this special demand when it arrives.

The number of tested cows in the year just completed was 2,169, a slight decrease on the previous year's figures. Considering the many

hardships breeders have had to contend with, an average of 349 lb. butterfat for the past year is gratifying.

Some 127 herds were tested; 75 herd entries were refused owing to staff shortage, and there were nine withdrawals during the year, principally due to labour shortage on the farms.

The policy of the Department of Agriculture is to make the test as reliable and accurate as possible, and dairy farmers may accept the records with confidence.

Champion Herd

The championship on this occasion goes to Captain A. E. T. Payne's herd of eighteen "Yarraview" Guernseys. This herd has an excellent average yield of 506 lb. butterfat, increased to 556 lb. when all allowances are added.

TABLE SHOWING THE PROGRESSIVE IMPROVEMENT OF THE "YARRAVIEW" HERD.

Year.	Number of Cows.	Butterfat without Allowances.	Butterfat with all Allowances.
		lb.	lb.
1935–36 ..	20	368	437
1936–37 ..	25	380	445
1937–38 ..	17	421	472
1938–39 ..	20	451	515
1939–40 ..	33	452	527
1940–41 ..	27	462	525
1941–42 ..	20	511	562
1942–43 ..	18	506	556

Captain Payne's herd has been consistent in high butterfat production since it was entered in the test eight years ago, gaining the Reserve Championship in 1938-39 and being placed in third position in 1939-40, and again in 1940-41.

Dr. A. R. Haywood's "Windrest" Jersey Stud, Reserve Champion Herd last year, again occupies the Reserve position on this occasion. The herd of 25 has a splendid yield of 502 lb. butterfat or 551 lb. with all allowances, and is down only 5 lb, in actual butterfat on the previous year's average. An interesting feature of this herd is that one bull "Gadget" (imp.) sired more than half the herd.

The "Mornmoot" Jersey herd of Mr. R. M. Chirnside has once more come into prominence, being third with 24 cows, with an average yield of 474 lb. butterfat, increased to 545 lb. when all allowances are added.

In fourth place is Mr. N. H. Enders's "The Wattles" Jersey Stud, with an average of 447 lb. butterfat from sixteen head, increased to 531 lb. when due allowances are added.

Mr. P. J. Maloney's "Belgonia" Jersey herd occupies the next position with 447 lb. butterfat for 30 cows, increased to 522 lb. with all allowances. A special feature is the 398 lb. butterfat of the eleven Junion two-year-olds. These heifers were all sired by Mr. Maloney's latest importation, "Baron Design." This young bull shows great promise as a sire of good butterfat producers.

The herd next in order is that of Messrs. P. W. Clark and Son, of Whittlesea which averaged 434 lb. butterfat, and 506 lb. with allowances, from 22 Jersey cows.

Among the herds of less than fifteen cows, Mr. R. H. Mitchell's stud, "Clifford Farm," has for some years past been one of the leading herds in this section. On this occasion his herd of thirteen Jerseys heads the list with an average of 509 lb. butterfat with allowances.

Messrs. O. Ronalds, H. Jackson, S. H. Masters and Son, Mrs. A. A. Dennis, Messrs. G. E. Hodgins, H. A. Keele, and Nancarrow Brothers all did well in this section.

There are many splendid performances among the various herds, but perhaps the most outstanding is the average production of 337 lb. butterfat and increase to 441 lb. with

Dr. A. R. Haywood's junior 4-year-old Jersey, "Windrest Twinkle's Charm," produced 715 lb. butterfat.

allowances by Messrs. G. A. McNabb and Son's 88 "Maxon" Jerseys, the largest herd tested for the year. All classes from Junior two-year-olds to mature cows are represented. The 29 Junior two-year-olds averaged 287 lb. butterfat, and, at the other end of the age limit, 24 mature cows furnished an average of 376 lb. butterfat. This splendid yield can be better appreciated when it is remembered that high production yields are more difficult as the herd increases in size.

Among other large herds with good performances are—State Research Farm, Werribee, 65 Red Polls (309 lb. butterfat); Mr. W. K. Atkinson's 49 "Willow Park" Shorthorns (352 lb.); Messrs. J. Moore and Company's 42 "Tooloonook" Jerseys (334 lb. butterfat); Mr. C. S. Walker's 41 "Warwick" Jerseys (370 lb.); W. H. Lyon's 40 "Avon" Jerseys (386 lb.); J. W. Bennett's 38 "Ellendale" Jerseys (404 lb.); G. S. Daley's 37 "Devon Park" Jerseys (409 lb.); and 36 "Springhurst" Jerseys (401 lb.).

The 2,169 cows tested during the year averaged 349 lb. butterfat for the 273 days of the test, which is only 3 lb. below the previous year's average. Of the cows which completed their lactation periods, no fewer than 1,679 qualified for their certificates. The results are marked by a large number of particularly good yields. No fewer than 137 cows did better than 500 lb. butterfat in the 273 days, and of these 25 exceeded 600 lb., 3 more than 700 lb., and one over 800 lb.

Champion and Reserve Champion Cows

The highest yield for the year under review was the 818 lb. butterfat returned by "Warwick Maggie Woodcrest," by "Greenvale

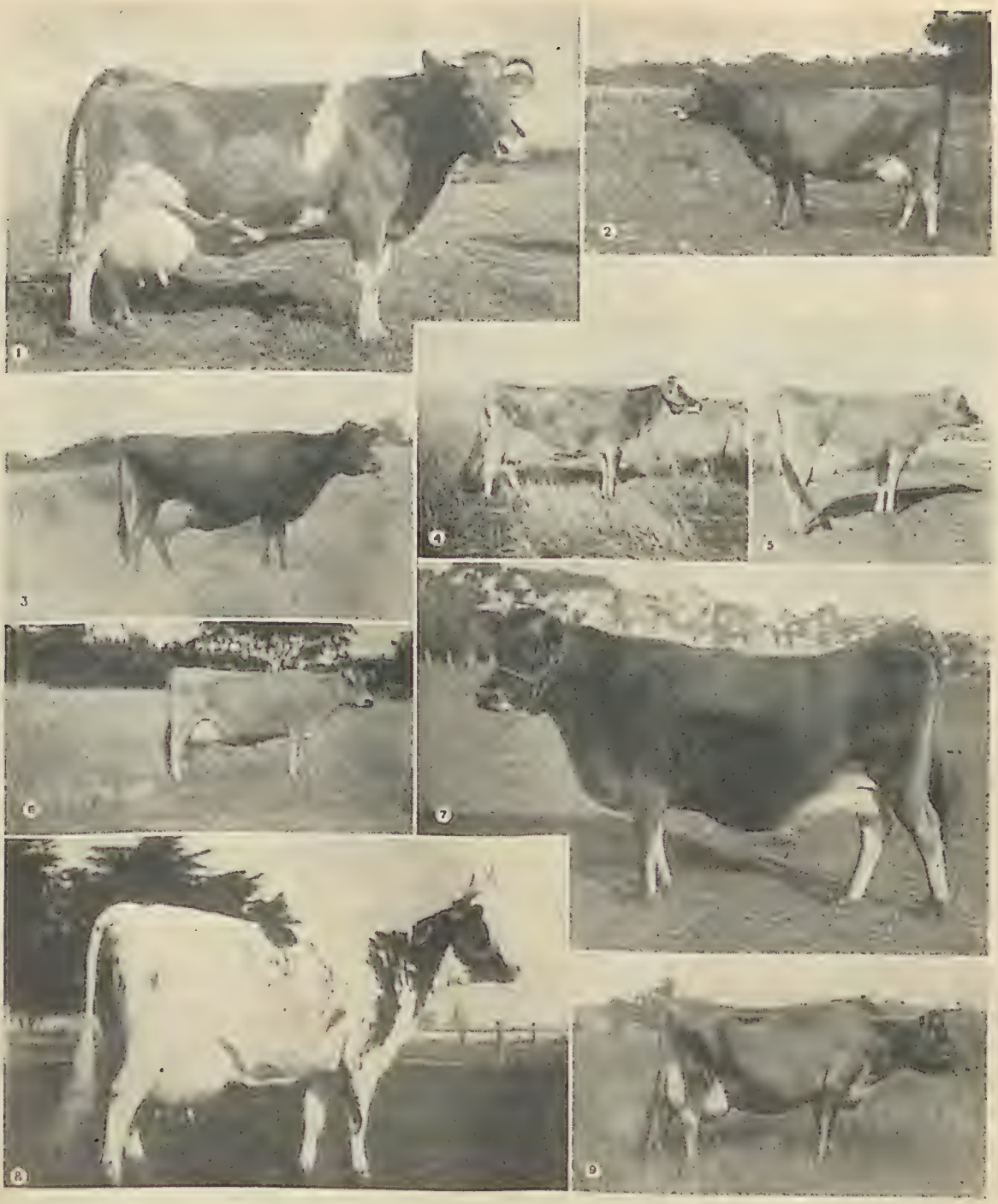
The Friesian cow "Warwick Maggie Woodcrest," owned by Mr. C. S. Walker, Swan Hill, produced 818 lb. butterfat, highest yield for the year.

Woodcrest Oakwood 2nd" x "Burnbank Maggie Alcartra," a member of the Friesian Herd owned by Mr. C. S. Walker, of Swan Hill. Entered in the mature class, this great cow produced, in the 273 days, 23,836 lb. milk, with an average test of 3·43 per cent., equivalent to 818 lb. butterfat. In her previous three lactations she produced 636 lb., 586 lb., and 557 lb. butterfat, so that her excellent return this year is evidently no flash in the pan. As is frequently the case with high yielders, she was milked thrice daily. Actually her average daily milk was 87·3 lb. for the 273 days.

The leading junior 2-year old, "Yarraview Heiress," owned by Capt. Payne. She produced 538 lb. butterfat.

The Reserve Champion, "Willow Park Duchess 35th," a six-year-old Dairy Shorthorn owned by Mr. W. K. Atkinson, returned 691 lb. butterfat from 18,515 lb. milk, with an average test of 3·73 per cent. On her previous lactation this daughter of "Wicklesham Lord Barrington 5th" x "Willow Park Duchess 19th," gave 503 lb. butterfat and was also milked three times daily.

The second highest producer for the year was "Yarraview Rougette," a senior three-year-old Guernsey, with 778 lb. butterfat, an Australian butterfat record for a Guernsey of this age. As a senior-two-year-old, she also had broken the record for the breed.



Some of the high producing cows in this year's Test.

1. Capt. A. E. T. Payne's mature Guernsey "Rose Gem of Maple Lodge," 763 lb. butterfat. 2. Dr. A. R. Haywood's Jersey, "Windrest Island Goldmine," 659 lb. butterfat. 3 "Banyule Molly 60th," the leading senior 4-year-old, 605 lb. butterfat (Banyule Pty. Ltd.). 4. Mr. R. M. Chirnside's "Mornmoot Princess Madeira 9th," 632 lb. butterfat. 5. Mr. C. S. Walker's mature Jersey, "Warwick Polly 10th," 649 lb. butterfat. 6. "Tooravale Princess 23rd," mature Jersey, 622 lb. butterfat (J. E. Handbury and Son). 7. "Bamawm Bonnie Lass 2nd" (Estate of the late F. A. Williams), 650 lb. butterfat. 8. Mr. J. H. Goddard's mature Ayrshire, "Inverurie Hester," 663 lb. butterfat. 9. "Belgonia Eileen 2nd," 665 lb. butterfat (Devon Park Stud).

[*Continued on page* 469.

POULTRY KEEPING AS A SIDE-LINE

By W. O. PEDERICK

The present demand for eggs to supply the Fighting Forces and the civilian population is very considerable. Farmers could assist materially in meeting this demand by running a small flock of poultry as a side-line. In doing so they would be aiding the war effort and at the same time making an acceptable addition to their farm income.

An attractive flock of WhiteLeg horn pullets.

ALTHOUGH it occupies fourth position on the list of Victorian primary industries, the poultry industry owes much of its importance to the many small flocks kept on farms and in suburban backyards. This assertion is borne out by the last census of poultry in this State, which revealed that four-fifths of the total number was comprised of flocks of under 300 birds.

Wheat growers, graziers, dairy farmers, and orchardists have proved that poultry keeping can be a profitable side-line on the farm; in fact there have been times when some of them would have been unable to carry on without their poultry.

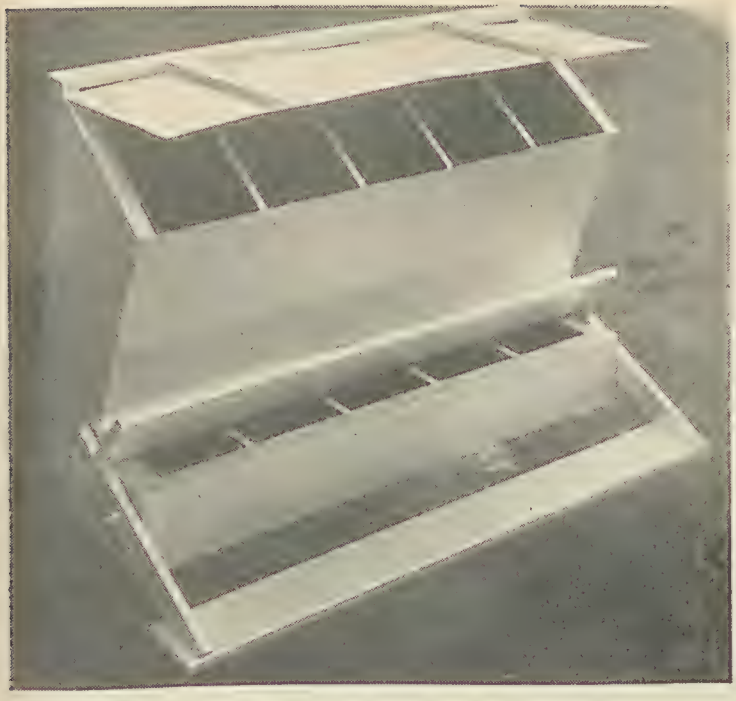
Although profits vary considerably from year to year, according to general management, cost of food, price of eggs, quality of the flocks, &c., a rough estimate of the return for each bird per year would be 6s. to 7s. On this basis a flock of 300 layers should return approximately £2 per week. Where a large percentage of the food is produced on the farm, however, the feeding costs are considerably reduced, and the profits raised.

It is important that poultry keeping should not interfere with the general farm work. In other words, it should be kept as a side-line, but a flock of 200 to 300 birds can be managed with little additional labour and expense. The essentials for success are:—

1. Pure bred stock of good laying strain.
2. Good housing.
3. Good feeding.
4. Intelligent marketing.

Breeding

Unprofitable poultry keeping is often due to the fact that the birds are not pure bred, or, if pure, are not bred from a high producing strain. High egg production can be bred into poultry just as surely as high butter-fat production is bred into dairy cattle. There should be no difficulty in obtaining chickens or stock which have been bred from proved strains.



Hopper used at Burnley, for free choice feeding.

The chickens should be hatched during the months of August and September, so that they will be laying in the late autumn and winter when eggs are dear.

The first two laying seasons are the most profitable; consequently the laying flock should be culled rigidly at the end of the second season. If this practice is strictly followed and older birds are replaced with pullets each year, the production of eggs should be maintained throughout the year.

Housing

The fowl house need not be expensive, but should be weatherproof and conveniently constructed for cleaning and care of the birds. If intensively housed, at least 4 sq. feet of floor space should be allowed for each bird. A shed 20 ft. x 20 ft. x 6 ft. high at the back and 8 ft. at the front would house 100 layers. If allowed on free range, a slightly smaller shed would suffice, but, unless sufficient good range is available, intensive housing is preferred. A small run is worse than no run at all; it soon becomes fouled and does more harm than good.

The floor of the shed should be covered with 4 to 6 inches of clean straw litter. If this is cleaned out every three months, the litter mixed with the droppings from the birds makes an excellent manure for garden or orchard or for top-dressing pasture.

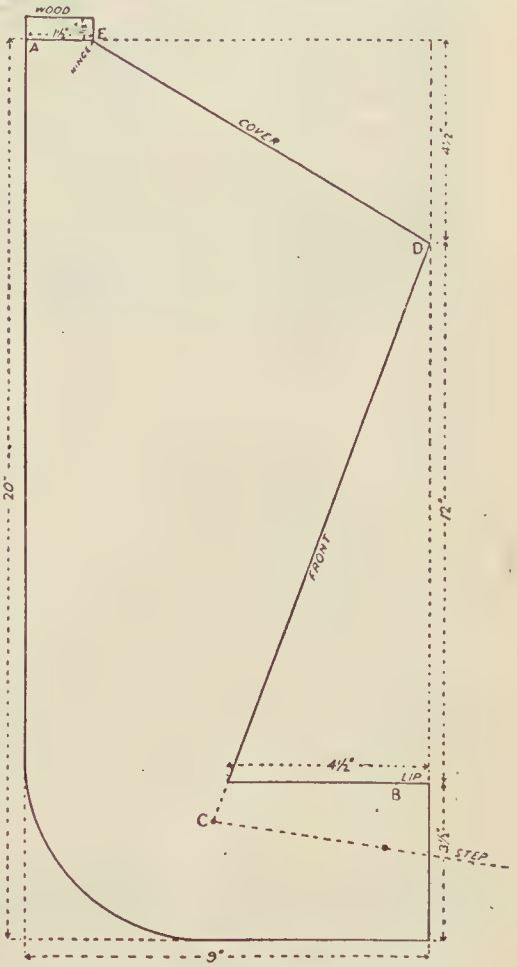
Feeding

A simple variety of plain wholesome foods is required for high egg production. The following ration is suggested:—

MASH.—Bran, 30 lb; pollard or crushed grains, 60 lb; meatmeal, 10 lb. If separated milk is available the mash can be mixed with milk, or the milk given to the birds to drink and the meatmeal reduced to 5 lb.

GRAIN MIXTURE.—Wheat, 60 lb; oats, 20 lb; maize or barley, 20 lb.

Although farmers have been successful with both wet and dry mash feeding, the latter saves a considerable amount of labour, as hoppers can be built to hold enough mash for a week or so. This means that the fowls need no attention in the mornings. A little



End view of hopper illustrated above.

greenstuff can be fed at midday and a full feed of grain at night, followed by as much green feed as the birds can eat.

Whatever system of feeding is adopted it is most important that the birds receive sufficient feed and should be given as much as they will eat.

Marketing

If good quality eggs are to be marketed, the following suggestions are recommended :—

Gather eggs twice a day.

Keep eggs clean by providing clean houses with plenty of clean litter on the floor, and good nests containing plenty of clean nesting material.

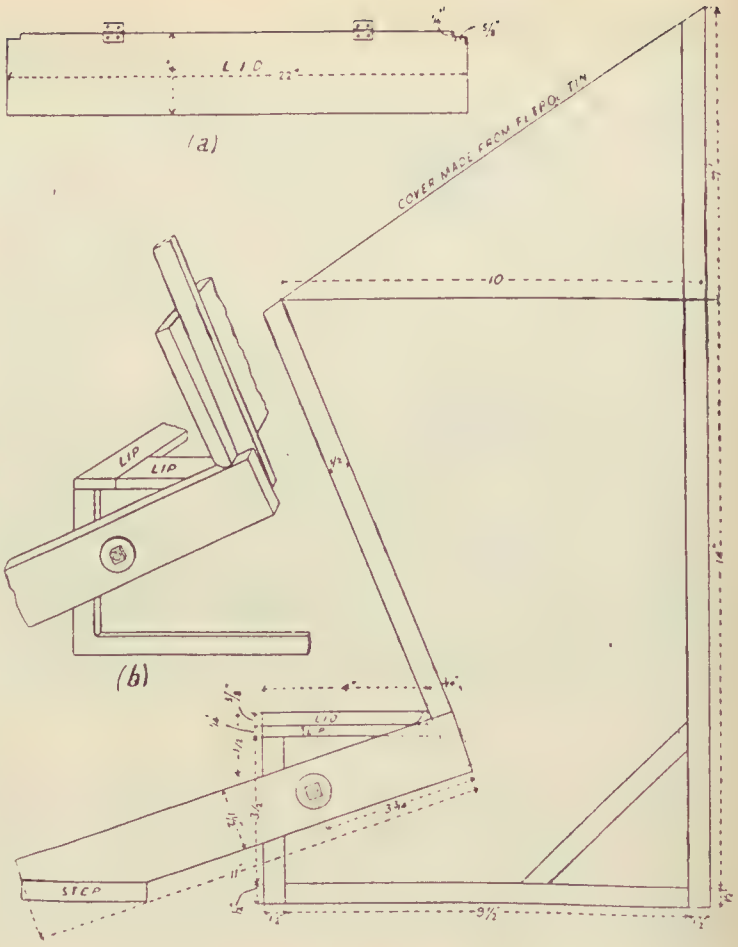
Keep eggs in a cool place before marketing.

Market eggs twice a week if possible, but at least once.

At the present time, when eggs are so urgently needed for the Fighting Forces and for the civil population, farmers could help the war effort materially by keeping a small flock of poultry as a side-line.

How to Make a Hopper

The hoppers in use at the Burnley Egg-laying Competitions are very simple to make. An illustration of one appears on the previous page. The partitions as shown in this hopper were used for free choice feeding, but where mixed feed is used they are unnecessary. The next illustration shows the shape of the end of the hopper. The two ends are made of wood, and the remainder consists of three pieces of plain iron. One piece covers the back, bottom, and front of the feed-trough from A to B ; the second piece covers the front from C to D ; and the third forms the cover from D to E, and is hinged on the top to a small piece of $1\frac{1}{2}$-in. x $\frac{1}{2}$-in. timber. This hopper is usually about 20 inches long, but can be made any length, and can be partitioned off if required. The automatic step can be attached as shown in the plan of the hopper made from a kerosene case, illustrated above.



Plan of an automatic hopper, (a) lid ; (b) step.

A simple hopper can also be made from kerosene or petrol cases. The main part of the hopper is made from one case ; the top section consists of a quarter of a case, cut on the angle so that the birds cannot roost on it.

It may be hung on the wall about 2 feet from the ground, and when the fowls jump on to the step the lid of the feeding trough will open.

A narrow lip about 1 inch wide is placed round the feeding trough to lessen the wastage of feed. An endeavour should always be made to construct the hoppers in such a way that waste of food will be reduced to a minimum. If some kind of automatic lid to the feed box is not provided, sparrows in the day time and mice and rats at night will eat large quantities of the feed.

DEVELOP YOUR LATENT TALENT
FOR GOOD NEIGHBOURLINESS

Seed Potato Certification Scheme

Objects and Conditions

By G. H. MATTINGLEY, Potato Field Officer

The first potato crop to qualify for seed certification in Victoria. It was grown by Mr. Jos. Knox, Weeaproinah.

THE Victorian Seed Potato Certification Scheme was established in 1938. The primary object of the scheme is to raise the standard of potato growing in the State, by stimulating production and distribution of "seed" of the main commercial varieties, which can be certified as possessing a high degree of purity and freedom from disease. This would be a comparatively simple matter, but for that insidious group of viruses responsible for degeneration in potatoes. Viruses are the smallest disease agents known, and for practical purposes those affecting potatoes are best described as "communicable poisons" which pass from one generation to the next in the tubers.

The symptoms of the various types of virus diseases are apparent on the tops of all affected plants in some degree, but not in the tubers.

The grower of Certified "seed" potatoes must become familiar with the symptoms before he is able to control these diseases in his crops.

The production of Certified "seed" should be confined to areas where the climate is such as to reduce the population of aphids to a minimum, but at the same time allow any plants which may be virus infected to show full development of the disease symptoms, so that rogueing can be done properly. Thorough and efficient "rogueing" or removal of undesirable plants is one of the most important factors in the maintenance of a healthy and vigorous seed stock.

Applications for Certification

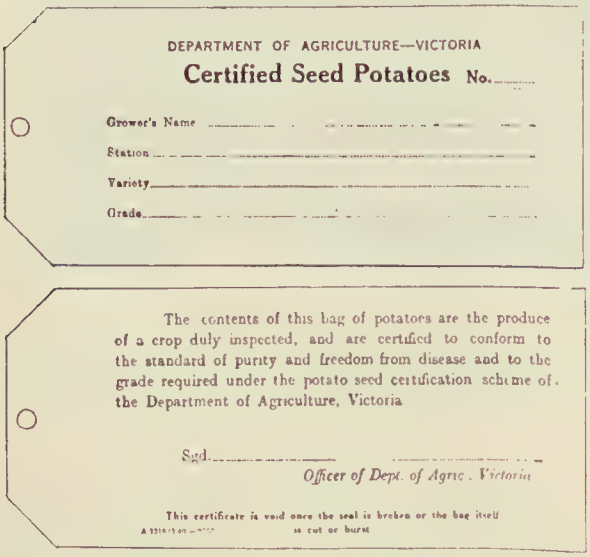
Growers desiring to enter their crops for certification must make application to the Department of Agriculture, Melbourne, C.2, giving all

necessary particulars regarding the crop, including source of seed and immediate history of the field being planted, and accompanying the application with the registration fee of 10s. *Applications close on 30th November of each year.*

At the time of application each grower is required to send to the Department for a comparison trial a representative sample of 14 lb. of the seed stock from which the crop submitted for certification is being grown. In the comparison trial plots, all samples are grown under identical and favourable conditions so that comparison may be made between the different lines.

New Growers

Any grower entering the scheme for the first time may not submit more than 2 acres of any variety for certification unless the performance of his seed stock has been critically examined and approved by Departmental officers in the previous season; or his crop is produced from certified seed, in which case the total area planted with certified seed will be accepted for inspection.


DEPARTMENT OF AGRICULTURE—VICTORIA

Certified Seed Potatoes No.

Grower's Name

Station

Variety

Grade

The contents of this bag of potatoes are the produce of a crop duly inspected, and are certified to conform to the standard of purity and freedom from disease and to the grade required under the potato seed certification scheme of the Department of Agriculture, Victoria

Sgd.

Officer of Dept. of Agric., Victoria

This certificate is void once the seal is broken or the bag itself is cut or burst

Label attached to each bag of certified potato seed.

Isolation

Owing to the means by which virus diseases spread in the field, viz., by insect carriers or vectors, it has been deemed necessary to insist upon some degree of isolation of crops intended for certification. In order to prevent, as far as possible, this spread of the disease from affected to healthy crops, those crops intended for certification must be at least one chain removed from any crop of potatoes not sown with certified seed, or any crop of the Brassica family (turnips, swedes, cabbages, cauliflowers, rape, mustard), which is also a host for the aphids carrying the virus diseases.

Rotation

In some districts the growing of several crops of potatoes in succession on the same land is followed as a part of the local farming economy. This practice, however, invariably leads to a proportion of volunteer or self-sown plants appearing in the succeeding crops.

There are two aspects to the question of self-sown plants, the most important being that these plants are likely to carry a higher proportion of virus infection than the bulk of the crop from which they arose. Self-sown plants, therefore, may constitute a serious menace to the health of the crop in which they appear. Again, if the previous crop were of another variety the possibility of mixing the two cannot be overlooked. From the standpoint of seed certification, foreign varieties or rogues are highly undesirable. For these reasons no crop grown on land which grew potatoes during the previous four years will be accepted for certification, unless the inspecting officer is satisfied that any danger arising from the causes outlined above has been eliminated.

To minimize possible attacks of tuber-borne scab diseases, it is strongly recommended that all seed used for sowing certified crops be dipped in some effective fungicidal solution such as formalin, corrosive sublimate or organic mercury compound.

Field Inspections

Crops are examined twice in the field while growing. The first inspection is made approximately 8 weeks after planting and the second 3 to 4 weeks later. At the first inspection, should there be any evidence of disease showing on the plants, it is pointed out to the grower, who is required to rogue the affected plants from the crop. If at this stage the crop shows a total of more than 10 per cent. undesirable plants it is rejected forthwith. The second inspection at flowering time will show whether previous rogueing has been done effectively and will give opportunity to check varietal purity.

Standard of Purity and Freedom from Disease

The standard required at the second field inspection is:—

Virus diseases less than 2 per cent.
Other diseases (rhizoctonia, wilt, blackleg) less than 1 per cent.
Rogues (foreign varieties, bolters) less than 1 per cent.

The Department of Agriculture reserves the right to raise or lower this standard of tolerance as the season and circumstances dictate. Should the crop pass the second field inspection it is approved, subject to the normal potato inspection, when the tubers are ready for despatch. A list of growers whose crops have been approved is published in the *Journal of Agriculture* for May each year.

Plants at right and centre show symptoms of Rugose Mosaic.

Grading

Certified "seed" potatoes must comply with the grade standard for "seed potatoes" as laid down in the Seventh Schedule to the *Fruit and Vegetables Act* 1928. This requires that the potatoes be sound and free from insect or fungous diseases and practically free from dirt or other foreign matter. The diameter of the tubers shall be not less than $1\frac{1}{2}$ inches and they shall be packed in packages legibly branded with the name of the variety and the words "Seed Potatoes".

To suit the various requirements of buyers of certified seed, several gradings may be made, viz.:—

Small	..	$1\frac{1}{2}$–$1\frac{3}{4}$ inches in diameter.
Medium	..	$1\frac{3}{4}$–$2\frac{1}{4}$ inches in diameter.
Large	..	$2\frac{1}{4}$–$3\frac{1}{4}$ inches in diameter.
Extra Large		Over $3\frac{1}{4}$ inches in diameter.
Run	..	$1\frac{1}{2}$–$3\frac{1}{4}$ inches in diameter.

Plant affected with Leaf-roll Virus.

Sealing

Tags, which must be applied for from the Department, are placed on the sewing twine about the centre of the bag. Both ends of the sewing twine are sealed with lead seals, stamped by the certifying officer when the parcel passes the final tuber inspection. It is pointed out that no potatoes are actually "certified" unless the bags bear official tags and seals are stamped with the words "Department of Agriculture, Victoria" on one side and "Certified Seed Potatoes", on the other. A sealing fee of 2s. per ton or part thereof is charged on all potatoes sealed. It should be noted that this charge is over and above the ordinary potato inspection fees.

When presenting his seed for tuber inspection, the grower is required to sign a declaration to the effect that the seed submitted is solely the produce of an area of crop which has been approved by an officer of the Department of Agriculture as conforming to the standards required under the Seed Potato Certification Scheme.

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Description of Virus Diseases

The main virus diseases affecting Victorian potatoes are mild mosaic, rugose mosaic and leafroll. The spread of these diseases in the field is almost in direct relationship to the local population of certain species of aphids. These insects are capable of picking up the virus when feeding on diseased plants, carrying it in their bodies, and injecting it into the healthy plants on which they feed.

Tubers from infected plants carry the disease, and when planted produce disease symptoms. These infected plants must be rogued from crops intended for certification as soon as detected, so as to prevent, as far as possible, the further spread of the disease in the crops.

There is also the latent virus or virus "X," which almost universally infects commercial varieties in Australia. On its own, virus "X" produces little or no definite symptoms, but in combination with the other virus types produces the symptoms described below.

Mild Mosaic is the general name given the disease caused by virus "A" in combination with virus "X". It is characterized by a more or less severe mottling, or the production of small light-green spots on the leaves, and may be accompanied by some reduction in size of the leaflets. Some distortion or crinkling of the surface occurs as well, owing to the unequal growth of the light and dark green areas in the leaflets. Affected plants die off prematurely with the vines falling outwards. Hot weather and dry conditions mask the symptoms, making recognition difficult under these circumstances. The yield from affected plants is reduced. The Carman group is very susceptible to this disease, while Snowflake, Up-to-Date and the American varieties Katahdin and Sebago are immune.

Leaf showing Mild Mosaic.
[After *U.S. Dept. Agric. Cir. No. 271.*

Rugose Mosaic is caused by virus "Y" plus virus "X". In the season of infection small brown specks and rings of dead tissue appear on the leaves which shrivel up and fall, leaving only the growing tip. This condition is known as "leaf-drop streak". The secondary and permanent manifestation of the disease takes the form of severe distortion of the leaves with the tip and edges curled down, accompanied by a distinct mottle. Affected plants are dwarfed and mature early with characteristic falling outward of the vines. The yield may be so reduced as to be almost negligible. The Carman group is particularly susceptible to rugose mosaic; Up-to-Date is subject to it to a lesser degree; Katahdin is slow to contract the disease, while Snowflake is very resistant under average farming conditions.

Leafroll is a growth abnormality caused by the leafroll virus. The primary symptoms, i.e., those which show in the year of infection, are a rolling inwards of the topmost leaves of the plants. This should not be confused with the condition caused by rhizoctonia. Secondary leafroll, that which occurs in succeeding years, results in a thickening and rolling inwards of the lower leaves after the plant is about 4 weeks old. The thickening and rolling gradually progress until the whole plant may be affected and has a stunted, erect appearance, is yellow-green in colour and is harsh and brittle to the touch. Substantial reduction in yield occurs, although affected plants mature normally.

All the commercial varieties grown in Victoria react to infection with leafroll virus, Up-to-Date being the most susceptible variety.

—— SUPPORT THE FOURTH LIBERTY LOAN ——

METROPOLITAN MILK SUPPLY

Compulsory Pasteurization Proposed

Speech made by the Hon. Norman A. Martin, M.L.A., Minister of Agriculture, in introducing the Milk Pasteurization Bill in the Legislative Assembly on 3rd August.

THIS Bill makes provision for the compulsory pasteurization and bottling of all milk consumed in the metropolis and represents part of the Government's proposals to ensure that consumers in the metropolitan area are provided with a clean and safe milk supply.

In spite of the criticisms that have been levelled at it following on the typhoid epidemic in the Cheltenham district, the Melbourne milk supply compares favourably with that of most other large cities. In fact, over the last twenty years there has been a very marked improvement in the sanitary and hygienic conditions on dairy farms supplying milk to Melbourne, and in the metropolitan dairies concerned in the treatment and bottling of milk.

Some indication of the improvement that has taken place is shown in the figures for over-all compliance with the bacterial standards fixed under the Milk and Dairy Supervision Act. These show that the percentage of samples of retail milk which complied with the prescribed standards steadily increased from 85·8 per cent. in 1933–34 to 95·4 per cent. in 1939–40.

Unfortunately this improvement was checked in 1940 and 1941–42 by wartime conditions, with a consequent manpower shortage on dairy farms and retail dairies, and the difficulty experienced in obtaining essential requisites such as bottle cleaning brushes, briquettes and fuel for sterilization.

However, it is encouraging to note that in the year just ended compliance with bacteriological standards was the highest on record. There is still room for further improvement and the Government policy is to bring that improvement about as effectively and as expeditiously as possible.

It has been proved that the unfortunate outbreak of typhoid fever in the Cheltenham district was caused by the presence of a typhoid carrier on one of the dairy farms supplying milk for distribution in that district. There is no system of dairy supervision which can be relied upon to detect persons who are carriers of infectious diseases, and an outbreak such as the Cheltenham one is always liable to occur where reliance is placed on a raw milk supply.

Medical literature supplies many instances of milk-borne epidemics, for example, in 1934, 40 epidemics of milk-borne diseases occurred in the United States of America, comprising 1,324 cases with 44 deaths and, in all except one case, where there was a doubt whether the whole of the milk supplied was pasteurized, raw milk was responsible.

Paul B. Brooks in the *Journal of Milk Technology*, July, 1939, reports that in the 22-year period, 1917–1938, there were recorded 151 milk-borne outbreaks in New York State. In New York city where all the milk is pasteurized none were recorded during the same period.

In the *American Journal of Public Health*, 1935, there is a report on milk-borne infections causing septic sore throats and erysipelas at Michigan in September, 1934. In a population of 630, 186 cases occurred, with six deaths.

The *Lancet* of the 5th September, 1936, records an epidemic of typhoid fever in England, when 900 cases occurred at Poole, Bourne and Christchurch. The death roll was 51 and the outbreak was found to be due to raw bulked infected milk. Sir Kingsley Wood, after visiting the district said, "Pasteurization immediately cut the outbreak short."

Apart from the presence of diseases communicable to men in dairy herds supplying milk, the greatest factor in causing milk-borne diseases is the presence of carriers and cases of infectious diseases among milkers and persons handling milk. In these cases the milk after its withdrawal from the cow is contaminated either directly or indirectly with infectious diseases, common examples are scarlet fever and typhoid fever. Raw milk could, therefore, only be safe if all the cows from which it is drawn are free from those diseases, which are communicable to man, and if

all the milkers and all the personnel engaged in handling milk in every stage of its production and distribution are at all times free from any infection that could be carried through the agency of milk.

The Government is taking steps to eliminate as far as possible all diseases from herds supplying milk to Melbourne, but medical authorities everywhere admit that, in practice, the difficulty of ensuring that all the personnel engaged in handling milk are free from infections that may be carried through the milk, is an insuperable one.

It would involve the regular bacteriological and pathological examination of all persons handling milk in the course of its production, treatment and distribution.

In the present state of medical science, therefore, protection of the consumer against milk-borne diseases can be achieved only by efficient pasteurization, which will kill the disease-causing organisms, which may be found in raw milk, and by taking adequate steps to prevent re-infection.

Up till fairly recent times medical opinion was divided as to the advisability of pasteurization but at the present time the general consensus of medical, veterinary and scientific opinion throughout the world is definite that no raw milk supply can be regarded as completely safe, and that to provide proper protection against milk-borne diseases, efficient pasteurization is necessary. Evidence of this is shown in the following quotations from authoritative reports :—

> One of the most important international investigations into the milk problem was that made by an International Committee appointed by the Health Committee of the League of Nations in 1936 and reported in the Bulletin of the Health Organization of the League for June, 1937. Its conclusions were summarized in these words—"No raw milk can ever be regarded as completely safe for human consumption. It is our considered and emphatic opinion that all milk for human consumption should be adequately pasteurized or boiled."

In England a committee consisting of eminent doctors, including Lord Dawson of Penn, Lord Horder (Physician in Ordinary to the King), Dr. R. Veitch Clark (honorary physician to the King) and the Principal of the Royal Veterinary College has just submitted to the Ministers of Health, Food and Agriculture a report which states :—

> "It has now been proved that the pasteurization of milk causes no material changes in the nutritive value of milk, that it does not injure milk in any way, and that, properly carried out, it destroys all tubercle bacilli and other pathogenic bacteria which may be found in milk. So treated, milk retains its properties unharmed, and is rendered safe to drink."

The report of the Economic Advisory Council of Great Britain Committee's Report on Cattle Diseases (1934) states :—

> "An unprejudiced survey of the evidence available to-day will leave on most minds a conviction that any recognizable changes of quality induced in milk by pasteurization rightly conducted are as a whole too small to outweigh the great advantage inherent in the protection from infection which the treatment secures, and in the public confidence which it inspires."

The National Health and Medical Research Council of Australia in June, 1937, passed the following resolution :—

> "In view of the amount of infection from various diseases which takes place in Australia through the milk supplies, the Council recommends that the principle of the desirability of pasteurization of all milk supplied for human consumption be affirmed."

A representative deputation of the medical profession which waited on the Premier on the 6th May strongly recommended the compulsory pasteurization of the metropolitan milk supply.

The *American Journal of Public Health* 1935 dealing with milk-borne epidemics states :—

> "It is recognized that efficient pasteurization of the milk supply, coupled with proper precautions to prevent its subsequent contamination, is the ultimate solution."

The consensus of medical, veterinary, and scientific opinion throughout the world, therefore, is that efficient pasteurization will give consumers protection against diseases which may be conveyed by milk, such as bovine tuberculosis, undulant fever, typhoid fever, scarlet fever, and septic sore throat, and that any changes in the nutritive value of milk induced by pasteurization are too small to outweigh the great advantages in safeguarding public health.

The normal daily consumption of milk in the metropolitan area is approximately 360,000 quarts, of which 137,000 quarts are drawn from nine country treating depots, and 233,000 quarts direct from 1,100 farms. Of the daily consumption of 360,000 quarts, 108,000 quarts are subjected to heat treatment at country depots

and forwarded in bulk to the city, and 92,000 quarts are pasteurized at 25 dairies within the metropolitan area. Of these 92,000 quarts, approximately 66,000 quarts are bottled immediately after pasteurization. The fact that a large percentage of metropolitan milk has been consumed in the raw state has always been regarded as a danger to public health, but this danger has been considerably increased by reason of the recent typhoid epidemic in the Cheltenham district. Over 400 persons contracted the disease and a proportion of these are likely to be carriers of the disease. This has intensified the risk of further outbreaks and renders the introduction of compulsory pasteurization urgent.

In framing legislation to bring about the compulsory pasteurization of the metropolitan milk supply it would of course have been possible for the Government to proceed by way of a direct enactment that after a certain date no milk should be sold for consumption in the metropolitan area unless it had been pasteurized and bottled in the prescribed manner. This would place on every dairyman distributing milk in the metropolitan area the responsibility of either equipping his premises with a pasteurization plant or obtaining his supplies of pasteurized milk from another dairyman. If this were done, in view of the shortage of manpower and materials for the manufacture of pasteurizing plants, there would be confusion and wild competition among dairymen for pasteurized milk, because the necessary equipment for the 275 dairies that are now without those plants, is unobtainable. Inquiries have shown that it would be impossible to obtain equipment within a reasonable period for anything like that number of dairies.

The larger dairies equipped with pasteurization plants would increase the amount of milk pasteurized and would be in a position to force smaller dairymen to come to arrangements with them for their supplies of pasteurized milk. The situation would be so irksome to the bulk of dairymen, and the application of the regulation would seem to be so unreasonable that it must break down.

Even if sufficient labour and equipment were available, it would be undesirable to permit the 275 non-pasteurizing dairies in the metropolitan area to install pasteurization plants because it would be impossible to give these plants adequate supervision of the technical processes, and it would add unnecessary cost to the consumer, as many of these dairies are too small to warrant the capital coat involved in providing pasteurization equipment.

In this connexion it is necessary to bear in mind that pasteurization is a technical process for the destruction of organisms causing disease which may be present in milk. Efficiency of pasteurization is dependent upon the design of the plant, and the strict observance of the conditions relation to time and temperatures, hygiene and sanitation, and adequate precautions to prevent the recontamination of the milk after it has been pasteurized.

Inefficient pasteurization by reason of the feeling of false security which it induces can be a serious menace to public health and strict official supervision of the premises and technical process of pasteurization plants is necessary to protect consumers. For this reason a number of places where the pasteurization of milk is carried out must not be greater than can be adequately supervised.

It is also essential to provide against possible recontamination of the milk by human handling or other means, until it is delivered to the consumer and this can be done only if the milk immediately after treatment is cooled, bottled and sealed mechanically.

As the cost of transporting bottled milk from country pasteurization depots to the city would be excessive, this means that the pasteurization and bottling of the milk must be done in the metropolis.

On the other hand, it is felt that it would be undesirable to allow the pasteurization of the Melbourne milk supply to pass into the hands of one or two monopolies, which experience in other countries has shown would almost certainly happen unless there is Government regulation.

The Government feels that the most effective way of bringing about the compulsory pasteurization of the metropolitan milk supply is to give to the municipalities the responsibility of providing pasteurized milk for consumers within their boundaries and, at the same time, to make the most effective use of existing suitable pasteurization plants under the control of private enterprise. In order that this policy of the Government may be applied in a systematic and orderly manner, the Bill proposes to set up an Expert Pasteurization Survey Committee, whose duty it will be to survey the existing facilities for the pasteurization and bottling of milk for consumers in the metropolitan area, to advise what additional facilities are required to make

adequate provision for the metropolis, and to submit a scheme providing for the pasteurization and bottling of all milk in the metropolitan area having regard to the two principles outlined above.

The Committee will consist of an officer of the Department of Agriculture, who will be chairman, a member of the Milk Board, Dr. Albiston the Director of the Veterinary Research Institute and Milk Laboratory, and a municipal officer of health of one of the metropolitan municipalities selected from a panel nominated by the Metropolitan Sectional Council of the Municipal Association.

In the preparation of its scheme the Committee shall, as far as practicable, make provision for the use of suitable existing facilities and for the establishment by municipalities or groups of municipalities of such additional pasteurization and bottling depots as are required.

In order to expedite the pasteurization of milk in municipalities where facilities are available or can be readily provided, the Committee is authorized to prepare special plans for individual municipalities or groups of municipalities and to include these later in the general scheme for the whole metropolis.

On approval by the Governor in Council the scheme submitted by the Committee becomes operative and the Minister may require the council of any municipality, or the councils of any group of municipalities, to erect a pasteurization depot of such capacity, nature and design as he specifies. The Minister also may grant to any existing pasteurization depot a licence to pasteurize. Provision is made for the payment of compensation to the owners of pasteurization plants for any loss incurred by them by reason of their not being granted a licence, and also for the payment of compensation to the owners of bottling plants for any loss suffered by them as a result of their bottling plants being rendered inoperative.

In municipalities where there are no existing pasteurization plants, it is probable that the Committee will recommend that several councils should combine to establish a pasteurization depot because large units are more economic.

In other municipalities where there are one or two small privately owned pasteurization plants, it might well be that the Committee will recommend that these be allowed to continue to pasteurize the milk required for their own trade, and that the council establish a pasteurization depot for the balance of the milk consumed in the municipality. In some municipalities the capacity of the existing privately owned pasteurization plants is sufficient or more than sufficient for the needs of the municipality. In these cases there has been a large capital expenditure in the provision of plant and equipment, and there would be no justification for not making use of it. It is probable that in these cases the Committee will recommend that these depots be allowed to continue and that arrangements be made whereby every dairyman, distributing milk in such municipalities, will be able to obtain his requirements of pasteurized and bottled milk from these depots.

The price which the municipal council or private pasteurization depot may charge for pasteurized bottled milk will be fixed by the Governor in Council, on the recommendation of the Milk Board.

Where a municipal depot is established, the council or group of councils will purchase the whole of the milk required for the municipality, will pasteurize and bottle it, and sell the pasteurized bottled milk to the dairymen distributing milk in the municipality.

It is necessary to give the councils these powers, because it would be impracticable for the council to pasteurize milk on behalf of a large number of individual dairymen.

It would be impossible to keep each dairyman's lot separate, and this would leave the way open for friction between the council and any dairyman who claimed that the milk received by him from the council after treatment was not as high a quality as the milk delivered by him to the council for treatment.

To protect dairy farmers and milk depots supplying milk to dairymen who, when the scheme comes into operation, will purchase bottled pasteurized milk from a municipal or licensed pasteurization depot, power is given to the Governor in Council to make regulations after consultation with the Milk Board for the transference and modification of contracts for the purchase of milk as is rendered necessary or desirable as a result of the operations of the Act.

From the point of view of the Milk Board, the purchase by councils of the milk required for the municipality will be a desirable feature, because it will eliminate price evasion in its various forms, which has rendered the policing of the Milk Board determinations exceedingly difficult.

Where a municipality has established a pasteurization depot, no person shall erect or establish a new pasteurization depot or extend any existing

pasteurization depot except with the consent of the council. As the erection of a municipal pasteurization depot will involve the council in a large capital expenditure, it is reasonable that having incurred this expense to provide for the needs of the municipality its interests should be protected.

Subject to the approval of the Governor in Council, any municipality acting on its own behalf may acquire any privately owned pasteurization depot, or may close any privately owned pasteurization depot within its boundaries. Approval will not be given unless the Governor in Council, after due enquiry, is satisfied that such a step is desirable in the public interest.

If the council and the owner of a pasteurization depot, which has been acquired or closed, cannot agree as to the amount of compensation to be paid by the municipality, the matter is to be determined by a judge of the County Court nominated by the Minister.

Honourable Members will appreciate that because of shortage of manpower and materials, difficulty will arise in connexion with the building and equipping of pasteurization depots, but representations will be made to the Commonwealth Government that, in view of the urgency of the matter from the point of view of public health, sufficient manpower and materials should be released to enable the municipalities to erect and equip the necessary pasteurization depots as expeditiously as possible.

When attending the Agricultural Council meeting recently in Sydney, I took the opportunity of discussing this matter informally with the Commonwealth Minister for Commerce, who promised that the request of the State Government would receive sympathetic consideration.

In my opinion, the plan envisaged in this Bill is flexible enough to meet the difficulties and complications likely to arise and to provide for the pasteurization and bottling of the metropolitan milk supply in the speediest and most efficient manner.

The Government's expert officers have closely examined the whole position in an endeavour to formulate for inclusion in the Bill a more definite plan but, because of the varying circumstances in relation to existing pasteurization depots in the different parts of the metropolis and the necessity of ensuring that the plan adopted will not deprive those engaged in the business of milk distribution of their goodwill and assets, it is felt that the more flexible plan provided for in the Bill offers the best solution of a very difficult problem.

It will be noted that this Bill makes no provision for the compulsory pasteurization of cream, but I can assure Honourable Members that this is not an oversight. Practically all the cream sold for table use in Melbourne is pasteurized at present before it is brought into Melbourne. I am having investigations made as to whether the present method of pasteurization provides an efficient safeguard and, if any change is necessary, it can be brought about by regulations under the Milk and Dairy Supervision Act.

That concludes the explanation of the Bill, which has been placed before Honourable Members, but in order to achieve its aim of providing Melbourne with a milk supply unsurpassed in any part of the world, the Government proposes to take further action which will result in milk, a most important food, reaching the consumer in the cleanest and safest possible form.

The Government is determined that every action practicable shall be taken to ensure that the Melbourne milk supply is brought to the highest possible standard in respect of both cleanliness and safety. The view of the Government is that, while compulsory pasteurization is necessary to protect the public from milk-borne diseases, it cannot be regarded as a cure-all nor can it replace hygiene and sanitation on dairy farms or dairies. Neither does it make less urgent the necessity of ensuring that only healthy animals are used for the production of milk for consumption in the metropolis.

Pasteurized milk is not necessarily a high quality milk as the quality of the pasteurized milk depends on the quality of the raw milk before pasteurization. Pasteurization will not make a dirty milk clean nor a stale milk fresh, in other words, the purpose of pasteurization is not to improve inferior milk, but to make good milk safe.

The aim of the Government, therefore, in respect of the metropolitan milk supply is, that the milk shall be produced from healthy cows under sanitary and hygienic conditions, that it be transferred to the metropolis under conditions that will prevent its contamination, and that on arrival in the city it be pasteurized and bottled.

To ensure that pasteurization is effectively carried out, and that proper supervision is exercised over the herds supplying Melbourne

with milk and the premises concerned in the distribution of this milk, it is proposed to take the following action :—

(1) The creation of a special metropolitan milk supply branch to control the supervision of farms supplying milk to the metropolis, and the supervision of the plants and premises concerned with the treatment and distribution of the milk, and the placing of the new branch under the control of an officer with scientific qualifications adequate to (*a*) properly direct the supervision of the milk supply, (*b*) prevent the possibility of infectious diseases of animals or man being conveyed by milk to consumers, and (*c*) keep the bacterial content of the milk to the lowest possible minimum ; in short, to ensure that the milk when it reaches the consumer shall be safe and clean.

(2) The application of the Tuberculosis Test to all dairy cows used for the production of whole milk, the elimination of all reactors, and the keeping of herds free from re-infection, and the elimination of cows infected with mastitis from herds supplying milk to the metropolis, and the prevention of further infection of the herds by the initiation of proper methods of control.

(3) The provision of additional staff and equipment at the Milk Laboratory maintained by the Department of Agriculture at the Veterinary Research Institute at Parkville for the purpose of continuously surveying the bacterial content and purity of the metropolitan milk supply.

This increase in staff will enable the Laboratory to undertake additional bacteriological testing of milk, and to undertake trials of the latest methods of mastitis control and treatment that are being evolved by research organizations throughout the world, and to conduct laboratory tests complementary to the field work of veterinary officers in the control of mastitis.

(4) An amendment of the Milk and Dairy Supervision Act to provide for the issue of a special licence to persons supplying milk to the metropolis. The Milk and Dairy Supervision Act at present makes no distinction between the licence issued to dairy farmers supplying milk to the metropolis and those supplying cream to butter factories. It is generally recognized that very strict standards in respect of premises, equipment, sanitation, and hygiene are necessary in the case of those engaged in the production and distribution of whole milk for the metropolis, and the amendments to the Act will provide for this.

The Government has given careful consideration to the administrative problems involved in the control of the metropolitan milk supply, and has come to the conclusion that a re-organization within the Department of Agriculture is necessary to ensure that the metropolitan milk supply is placed under the control of an officer whose qualifications are such as to fit him properly to appreciate the steps which it is necessary to take to protect consumers from the diseases which can be conveyed by milk.

Medical and other scientific opinion is most definite that the officer in charge of the milk supply of large cities should possess scientific qualifications, either medical or veterinary.

The representative deputation from the medical profession which waited on the Premier on the 6th May last emphasized this, and recommended that the Department of Agriculture should retain the control of the metropolitan milk supply, and that the supervision should be entrusted to "qualified scientifically trained officers."

In the American Army the control of the hygienic standards of all foodstuffs for human consumption and their inspection is in the hands of qualified veterinarians.

A qualified veterinary officer will be placed in direct control of the Branch and he will have on his staff appropriate technical officers both in regard to animal health and dairy sanitation.

With regard to the Government's plan for the elimination of tuberculosis and mastitis from dairy herds supplying milk to the metropolis, I desire to inform honorable members that up to date of the 95,000 cows used for the production of milk for Melbourne, 15,000 have been tested by Government veterinary officers and 25,000 by private practitioners.

The Government has approved of a systematic plan under which the remaining 55,000 will be subjected to the tuberculin test and reactors

eliminated at the earliest practicable date. The herds already tested will remain subject to test to prevent any danger of re-infection and no animals will be permitted to be taken into tested herds until they have been tested and found free from the disease.

The cost of the testing will be borne by the Government, and the services of private practitioners as well as veterinary officers of the Department will be utilized. Compensation in respect of animals condemned for slaughter because of their reaction to the tuberculosis test will be paid to dairy farmers from the Cattle Compensation Fund.

In regard to mastitis, veterinary officers will be attached to the new Metropolitan Milk Supply Branch, and one of their most important functions will be to eliminate cows affected with mastitis, and to assist dairy farmers in keeping their herds free from the disease.

I am glad to be able to inform honorable members that the Government has also agreed to initiate a campaign to eradicate brucellosis, or bovine contagious abortion. A vaccine known as "Strain 19" has given satisfactory results, and arrangements have been made whereby cultures of this strain will be prepared by the Animal Health Laboratory of the Council for Scientific and Industrial Research. At present the maximum production will not exceed sufficient to vaccinate more than 250 cows per week, so that for the present it will be necessary to confine this work to a limited number of herds. The basis on which the work will be done is that the farmer should pay the actual cost of the vaccine, which is approximately 6d. per cow, and that the Government will bear the cost of the services of veterinary officers who will administer the vaccine.

In submitting this Bill, the first that I have had the honour to submit to the House as Minister of Agriculture, I would like to assure honourable members that I have given a great deal of thought to the problem of placing the production and distribution of milk for the metropolis on a satisfactory basis and assuring consumers of a clean and safe milk supply. I am convinced that the passage of this Bill and the putting into effect of the administrative steps I have outlined, will give Melbourne a milk supply which will reflect credit on the State. I am sure that all honourable members, irrespective of their party affiliations, also have an earnest desire to see that objective brought to full fruition and I, therefore, feel confident in asking for a speedy passage for the Bill.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Pietsch, R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark," Nhill	Spiers, Albert	Bamawm Extension
Ellwood, A. H. ..	Paschendaele	State Experiment Farm ..	Rutherglen
Fairchild and Clutterbuck	Tinamba	Sutherland, R. N. ..	Nullawill
Geddes, L. D.	Bungaree	Trenery and Soderlund ..	"Promview," Foster
Hamblin, A. T., & Sons..	Toolleen	Trigg, A. J.	Bungaree
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
Hawtin, I. E. and F. ..	"Rossmoyne," Colac	Tweddle, J. T.	"Winlaton," Shepparton
Haywood, Dr. A. R. ..	Hastings	Walch, M. U.	Baring

Fertilizer Rations for Spring Use

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

THE rations of superphosphate and other fertilizers which will be available for spring-sown crops are as follow:—

Producers of priority crops, including potatoes, vegetables, tobacco, and sugar beet, will be able to obtain their essential supplies of superphosphate and other fertilizers. Application for a permit to purchase the fertilizer should be made on the prescribed form, copies of which are available from the Fertilizer Section, 81 Collins-street, Melbourne, the fertilizer suppliers and district officers of the Department of Agriculture. For potatoes, special rations of fertilizer will be granted only where the crop is grown under contract with the Australian Potato Committee. Contract forms and the application form for fertilizer have been posted to all potato growers registered last season. New growers should apply to the Fertilizer Section or to the local potato inspector.

Dairy farmers, and those with irrigated pastures, may expect a total ration of superphosphate for the year ending June, 1944, of approximately the same amount as that for the past year, 1942-43. It will include a No. 2 Supplementary Ration, equal in amount to the No. 1 Supplementary Ration recently allotted for dairying and irrigation.

The bulk of the superphosphate ration for 1943-44 will not be available until the summer-autumn period, but dairy farmers can now obtain for spring use an amount of superphosphate equal to their No. 1 Supplementary Ration up to a maximum quantity of 1 ton. Irrigation farmers may now receive a quota equal to one-half of their No. 1 Supplementary Ration, but an amount up to 1 ton may be obtained, provided it does not exceed the full supplementary ration.

No permit is required to procure the No. 2 Supplementary Ration, but it must be ordered from the same firm or distributor who supplied the No. 1 Supplementary Ration. Any quota due and not claimed in the spring may be procured later in the year 1943-44.

The ration for non-priority usage, including wheat, pastures (other than irrigated or dairy pastures), orchards, &c., for the year, July, 1943, to June, 1944, will probably be slightly less than that of 1942-43, and, in general, will not be available until the summer-autumn period. Farmers who require a quota for non-priority spring use, and who are not elegible for the No. 2 Supplementary Ration referred to above, can apply to the Fertilizer Section for a permit for their requirements for spring-sown crops. Application should be made on the form printed on the back of the priority-crop form. The quantity of superphosphate that can be granted for non-priority spring crops will be strictly limited, and will be part of the total ration of the applicant for the year 1943-44.

The rations referred to in the above statement are on the basis of 18 per cent. superphosphate. In cases where 22 per cent. superphosphate is supplied, the amount and the price are adjusted accordingly.

Nitrate of Soda for Orchards and Vineyards

The nitrate of soda recently made available for orchardists is now being delivered, and more than half the quantity on hand has already been ordered. Orchardists who have not already done so are urged to book their orders immediately and take early delivery.

The available ration is 2 cwt. per acre for fruit trees or vines, with 4 cwt. per acre for citrus trees.

The limited supplies of sulphate of ammonia will be reserved for vegetables, potatoes, and citrus fruits on irrigated land which are priority crops, while animal fertilizer, such as "blood and bone," is reserved for vegetables. Neither superphosphate nor mixtures of superphosphate and sulphate of ammonia will be available for fruit growing at present.

Nitrate of soda is a suitable alternative fertilizer to supply nitrogen to fruit trees and vines in the early spring, and it will be sold at the same price as sulphate of ammonia—£18 10s. per ton, f.o.r., Melbourne.

The application forms are available from all fertilizer agents, or from the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne.

Control of Water Competition

Maffra-Sale Irrigation District

By H. HANSLOW,
Commissioner, State Rivers and Water Supply Commission

A modern grader in operation.

THE Maffra-Sale Irrigation District obtains its water supply from the Glenmaggie Weir. The construction of the weir was commenced in 1919 and water was first made available for irrigation purposes in 1926.

The Maffra Irrigation district, comprising some 15,000 acres was constituted in 1926, and the Sale Irrigation District in 1927. In 1933 the two districts were amalgamated to constitute the present Maffra-Sale Irrigation District.

Water rights were first apportioned to these districts in the year 1928-29. The area irrigated in 1927-28 totalled 4,993 acres, in 1928-29 it rose to 9,009 acres, and in 1941-42 it was 22,971 acres.

When water rights were allocated, some farmers wanted the water, but many did not, and there was much opposition to the scheme. The Maffra district has an average rainfall of 23 inches, but it is most irregular, and dry autumns and springs are often experienced. The country is undulating and is from a red to a dark grey colour, and generally speaking the soil depth is variable. The soils are fertile and were at one time covered with red gum timber. The undulating nature of the land made it difficult to grade and lay out for irrigation, with the result that frequently channels and check banks run in all directions in the one paddock. Many fill-banks and flumes to carry water are in evidence. To a northern irrigator the grading would appear most difficult.

In addition to dairying, the district is also the centre of the sugar beet industry. Maize and fodder crops of the sorghum family are successfully grown, in addition to lucerne and mixed pastures.

In the country adjacent to Newry, splendid crops of lucerne are grown without irrigation, the roots having penetrated to underground water. Good water is obtainable at very shallow depths, and many dairymen have windmills with water laid on to the house, sheds and yards.

To-day, opposition to irrigation no longer exists in the district. Those landholders without it envy those who have it, and those with it seem to be making good use of it. Splendid fields of lucerne and pastures are to be seen. Most of the dairy herds are composed of a fine type of dairy cow, with Jerseys predominating.

On Tuesday, 9th March, 1943, the writer, on behalf of the Maffra Agricultural Society, judged a competition for "The Farm with the Most Efficient Use and Control of Water." The week previously the writer had judged a similar competition at Pyramid Hill where irrigation channels were 4 to 6 yards wide, and bays up to 47 chains long and 3 chains wide. At Maffra the channels are from 4 to 6 feet wide, with bays down to 2 chains long and half a chain wide. The land at Pyramid is very level and it is hard to get a penetration of water, but at Maffra the land is the opposite in both respects. At Pyramid the land is lower in value, and the areas are large. The big channels, even if "rubbish" does grow in them, will still carry plenty of water and provide rough feed afterwards. In Maffra the land is highly priced and most farms are small; the very rapid falls in some of the channels will cause scour if the water is not carefully handled. Even so, it seemed to the writer, with experience of northern irrigation areas, that most of the channels are on the small side, for time is a big factor in irrigation, although on a lot of the slopes irrigation must not be rushed or it may not be possible to obtain sufficient penetration, and also the land may be scoured.

All farms visited were well laid out and maintained. The types of dairy cows, the small paddocks for controlling grazing, provision for stock water, the dairies, sheds and yards, the many fine hay sheds, the "fill-banks" and flumes for carrying water over depressions, and the pastures and lucerne would be a credit to any irrigation district. But what surprised the writer most was the lack of control of water. The old mud bank to hold back the water was the rule on nearly all the farms visited. When all other jobs are done so well it seems surprising that such an important one as this should be neglected, especially when irrigations are done so often. The shovelling of wet mud banks is such hard work and the finished job so unreliable and likely to wash out that the construction of a permanent structure at every juncture at least would be money well spent. These structures are not expensive and can be made of either red gum or concrete. Structures made of red gum mill waste in 1915 on a property formerly owned by the writer were still good in 1938. Several sets of softwood doors, however, were worn out in that period. When making stops it is recommended that doors be made as near the width of the channel as possible, otherwise they may cause heading and scouring. By the use of doors it is possible to control and pass water on without risk of a bank washing out. There are some lands that do not "melt" when watered. In the irrigation opening in the channel, a piece of plain galvanized iron about four inches wider than the cut, with the top two inches rolled to stiffen it, pushed into the cut while wet and an inch into the bottom of the cut will make a watertight closure. The writer suggests that such a stop might be tried if the delver bank will stand up to it. This is a cheap and easy way of opening and closing the gap.

By an amendment of the Water Act, in 1942, the Commission can now make structures for farmers, and it is proposed, if man power and materials will permit, to make a limited number of outlets available in all district offices, and sell them at cost price to farmers.

The lack of systematic control of drainage water is noticeable in all the Commission districts. On most properties the water is expected to find its way to the low end of the property and into the drainage channel. Most of it does get there eventually, but grassland and stock would be much better if it could be got away quickly. The writer owned an 80-acre block of flat land at Koyuga. When it rained after irrigation the water lay about for weeks. A drainage channel was put through, and every channel on the property was connected to it. Twenty miles of furrows were constructed between the bays, and now, even after the heaviest rain, it is dry after 30 hours. The grass has improved, the stock do better, and grass grows in the furrows. To the writer nothing is more depressing than mud. To be able to drain yards, lanes, and paddocks is a great advantage. To know, when watering, that even if rain is threatening it will be possible to get the water away, saves much worry. The benefits are so obvious that every irrigator would be well advised to take every advantage of drainage channels.

One of the greatest troubles to both the irrigator and the Commission is to keep down the weeds in the irrigation and drainage channels, especially now, with the shortage of man power. Experiments by spraying with sodium chlorate seemed promising, but this chemical cannot now be obtained. Knapsack flame-throwers are being tried by the Commission. It is hoped that they will be successful and economical.

Points in the competition were allotted as follow:—

Lay out for irrigation ..	25 points
Channel structures ..	15 points
Cleanliness of channels ..	15 points
Drainage	25 points
Provision for stock water	10 points
Records of watering ..	10 points
Total ..	100 points

Mr. H. A. Creighton was the winner with 93 points. He presented a fine exhibit; his layout for irrigation was deserving of full points and his structures were good. The only exhibitor who had permanent openings into the bays, he could almost discard the shovel while watering. Fourteen points were allotted for structures, and eleven points for cleanliness of his channels, and full points for drainage. In three places the competitor has cut through one depression to another by a trench chains long and over eight feet deep, placed pipes, "back-filled" the trench, and finally piped the water into a billabong. Provision for stock water was good but not as good as some of the other competitors, and eight points were allotted. Full points were given for irrigation records as they were well kept, showing each paddock watered and the date and amount of water used. The Maffra Agricultural Society is to be congratulated for introducing the irrigation records section into the competition. Such records are most useful.

Mr. K. Stockel was second with 89 points. He also received full points for layout for irrigation and the same for structure as Mr. Creighton, but he gained five points only for cleanliness of channels. For drainage, full points were scored. This competitor is making full use of the drainage channel; every bit of the property is drained. Some of his land, salt-affected a few years ago, is now almost completely cured. Full marks were given for records.

The third competitor on the list is Mr. Trevor Harvey. Full points were scored for layout, fourteen for structures. Mr. Harvey had more structures than any one else in the competition. There was a structure at each juncture and also one on every contour. Thirteen points of a possible fifteen were given for cleanliness of channels. The possible points for stock supply and irrigation records were obtained, but no points were allowed for drainage. Mr. Harvey's land is deep loam over-lying sand, and gravel. His difficulty is to get the water over it, not off it, and there is no need to construct and maintain drains. The question was, could points be allotted for what nature had provided? In the circumstances this could not be done.

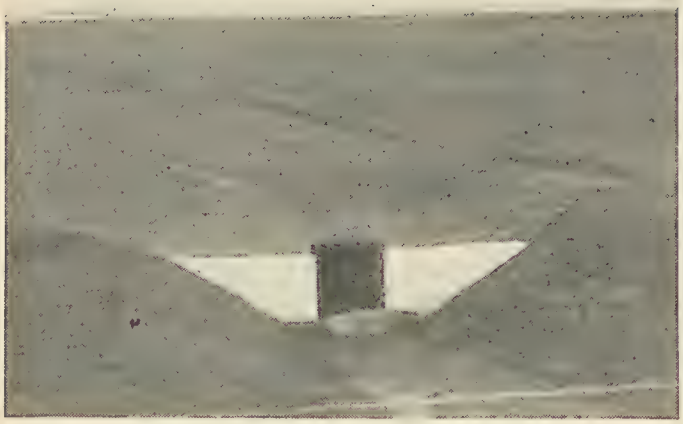
After considering the matter the Commission decided that Mr. Harvey's effort was worthy of a special prize, and an award of seven acre-feet of water was made.

Mr. J. D. Sim's entry is well worthy of mention. Mr. Sim had almost finished enough concrete structures for every junction at the time of inspection. He had just started to get a paddock ready to grade. It looked a most difficult job, but he assured the writer that some of the paddocks he had graded were worse than this one.

Mr. Hallows is doing something of interest to neighbouring farmers. He has planted a number of depressions in which drainage water lies with Poa Aquatica, which seems to be doing well. I have seen this grass tried up north with wonderful success.

The writer wishes to pay a compliment to Mr. C. Lambrecht. The last time he saw this competitor's property was in the drought of

Glenmaggie Weir.



Cement check in delver channel.

1938, when the farmers of Tinamba were asking the Minister of Water Supply for irrigation. What Mr. Lambrecht has done with the water since then is a credit to him.

In closing this report the writer suggests that all irrigators in Maffra cast their memories back to their district before irrigation. It will help them to realize what a wonderful thing irrigation is. If you cannot remember what it was like, go over to Nambrook-Dennison, take a look at that district and the Thomson River, and visualize what could be done there if all the water of the Thomson could be stored and turned on to those lands. Imagine the prosperity it would bring there. Then to know that a storage site for only a very small portion of the Thomson water can be found will make you realize how valuable a site for a water storage is. Now go back to the Avon River, take a look at it, and sit down and think what will happen to the Glenmaggie Weir if the river and the catchment of the Macallister go like the Avon. Laanecoorie Reservoir, on the Loddon, which a little over 50 years ago held 14,000 acre-feet of water, today holds 6,000 acre-feet only. Glenmaggie weir holds only 104,000 acre-feet today. Irrigators must realize that the watershed is very valuable if it is used for a catchment only. It is your duty as irrigators, to future generations of irrigators and to the nation, to watch that your watershed is not abused, and that Glenmaggie Reservoir does not turn into another Laanecoorie.

The results of the competition are as set out hereunder:—

CONTROL OF WATER COMPETITION—MAFFRA-SALE IRRIGATION DISTRICT.

List of Awards.

Name.	Layout.	Structures.	Cleanliness of Channels and Drains.	Drainage.	Provision for Stock Water.	Records of Waterings.	Total.
	25	15	15	25	10	10	100
Creighton, H. A.	25	14	11	25	8	10	93
Stockel, K.	25	14	5	25	10	10	89
Harvey, T.	25	14	13	..	10	10	72
Pearce, E. J.	23	10	10	6	10	5	64
Sim, J. D.	24	12	5	10	10	..	61
Higgins, J. C.	22	5	8	15	5	..	55
Bedggood, R.	23	8	10	8	5	..	54
Guthridge, R. A.	23	..	10	5	5	5	48
Hallows, H. J.	20	..	5	5	10	..	40
Lambrecht, C.	23	..	10	..	7	..	40

HELP OTHERS TO HELP YOU—CO-OPERATE

Advanced Register of Merit

Standard for Pure-bred Cows

By D. R. McKENZIE, Senior Dairy Supervisor

SINCE publication of the last report, 112 cows have been added to the Advanced Register of Merit.

The Register provides details of lifetime yields while under test, the highest production figures during that period, together with a cow's four highest consecutive yields which have been "age-corrected." Details of breeding and ownership, and the age of the animal, are also shown. The Register now contains the names of more than fifteen cows with ten or more records; while quite a number have at least eight or more records.

Pretty Noble (imp.) increased the butterfat production of his daughters over their dams' records by more than 50 lb. in the early years of the Standard Herd Test.

"Mornmoot Princess Madeira" completed her tenth lactation with 9,008 lb. milk, 489 lb. butterfat, with an average test of 5·43 per cent. Only on two occasions did she fall below 500 lb. butterfat, and on three occasions produced well over the 770 lb. mark. This cow still holds pride of place at the top of the Jersey section. Mr. R. M. Chirnside has many representatives of his herd in the Register, and a number of these are descendants of "Mornmoot Princess Madeira," a descendant of that remarkable cow "Madeira 5th" (imp.). It would be interesting to know to what extent this great cow has increased the butterfat production in the Commonwealth, as her descendants can be found in all States. Unfortunately, however, no data is available for this purpose.

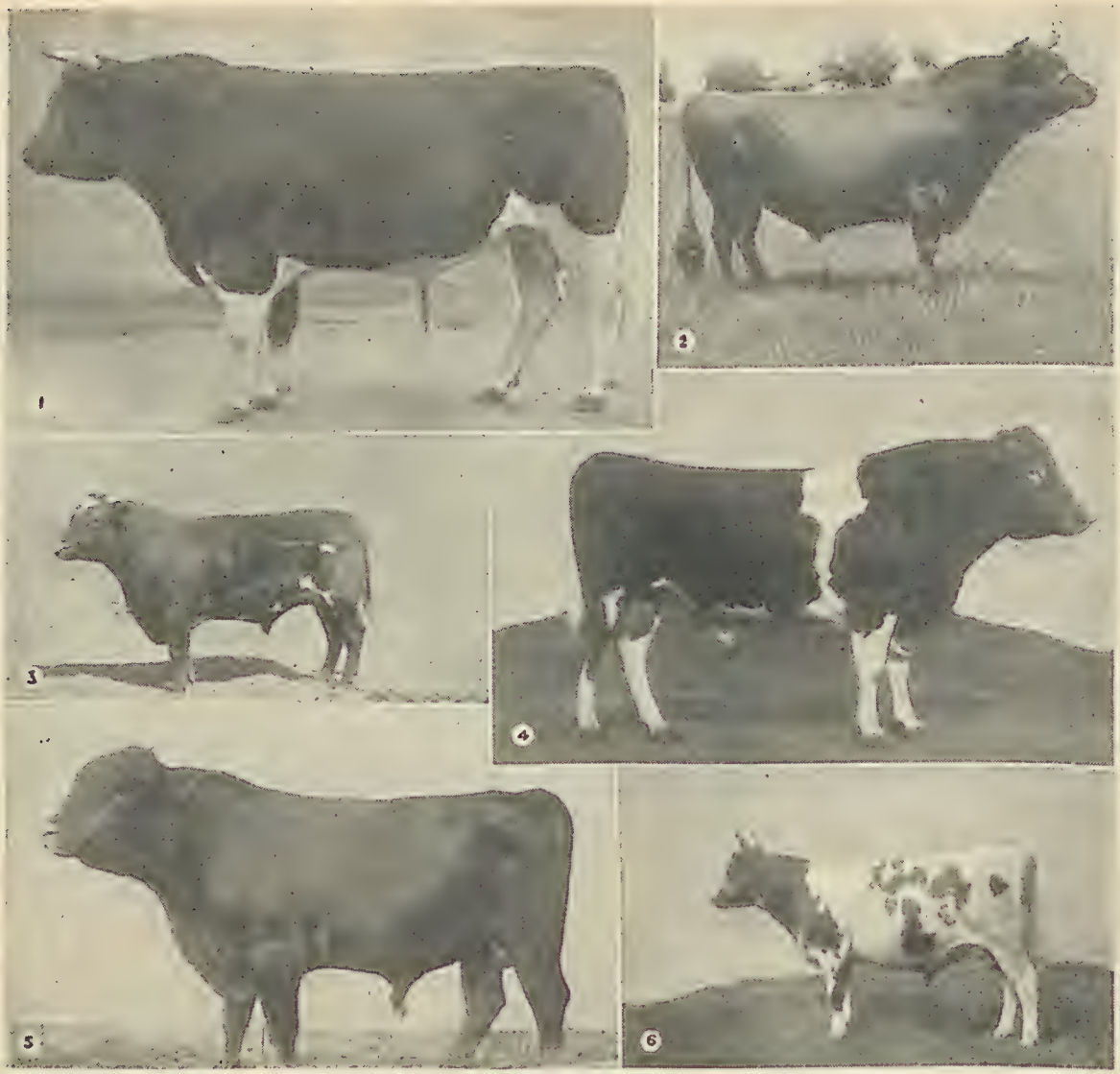
The "Mornmoot" Stud has another good producer in "Mornmoot Fancy Starbright," which holds a prominent position with 678 lb. butterfat. This ten-year-old cow has an actual yield of 606 lb. butterfat. The young cow "Mornmoot Mimi" shows promise with an average of 559 lb. butterfat over five lactations.

"Taranah Fairy," on the farm of Mr. J. J. Desmond, completed her thirteenth lactation at the age of twenty years. During that period this cow averaged 477 lb. butterfat, her best yields being 558 lb., 560 lb., and 558 lb., recorded at ten to thirteen years of age.

"Normandie Buttercup 2nd," with twelve lactations, has been a good performer, as is shown by her average of 524 lb. butterfat.

"Kantara Jessamine 2nd" and "Sylvan Hill Handsome Girl" both have eleven records, the first-mentioned cow with 463 lb. butterfat. She completed her eleventh record at the age of twelve years and four months, showing that she is a regular breeder as well as a high producer.

The thirteen-year-old "Ballara Bonnie," bred by Mr. F. T. Trevaskis, and owned by the estate of the late F. A. Williams, completed her tenth lactation with a return of 369 lb. butterfat, which brings her total yields under test to 5,687 lb. butterfat, equal to over 2½ tons. During her test career she exceeded 600 lb. butterfat on five occasions, four being successive.



Some notable sires.

1. "Victoria Top Note" (Friesian). 2. "Gadget" (Jersey). 3. "Wicklesham Lord Barrington" (Dairy Shorthorn). 4. "Camilla's Majestic of Maple Lodge" (Guernsey). 5. "Woodburn Peter Pan" (Red Poll). 6. "Inverurie Laddie" (Ayrshire).

Other cows in the ten lactation group to do well are "Victoria Flirt" with 532 lb., "Boorene Silver Light," 519 lb., "Victoria Volt," 514 lb., "Willow Park Comet 7th," 467 lb., and "Avon Dulcie," 449 lb. butterfat.

Information of many great sires, as well as cows, is available in the Register. The daughters of these sires have been excellent producers and breeders, and have brought the owners of these studs to the top and, in many cases, have kept them there.

A full list of cows which have qualified to be placed in the Advanced Register of Merit will appear in the Standard Herd Test booklet, to be published towards the end of September. Free copies of this booklet may be obtained after 1st October from the Superintendent of Dairying, Melbourne, C.2.

JOIN OR FORM A WAR SAVINGS CERTIFICATE GROUP

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Dairy Cows

IN the improvement of the dairy herds of this State, the first steps must be to improve the standards of feeding and herd management. Improved feeding is based on these fundamental principles which the Department of Agriculture has already proved most successful, namely :—

1. Pasture improvement to ensure that an abundance of nutritious pasture is available for most of the year.
2. Fodder conservation to provide good quality, cheap hand feed when the pastures fail, and
3. Feeding supplementary purchased concentrates to make up the deficiencies in either the pasture or conserved fodder or both.

Before attempts to breed better dairy cattle, or other stock for that matter, are successful, the present stock will have to be sufficiently well fed to enable them to produce to their full capacity. That stock are not fed to their productive capacity is well demonstrated in a good season when what are referred to as record yields are obtained, and then, in a poor season, production falls to a low ebb again. When stock are adequately fed, seasonal influences will be practically eliminated, and increases and decreases in production will be the result of breeding or some other factor.

It can be truly said that at the present time dairy cattle are bred much better than they are fed.

Better feeding and better herd management will also assist greatly in disease control on account of the greater resistance of well-fed stock and the ease with which disease can be handled in a well-managed herd.

Beef Cattle

The production of beef was maintained during 1942–43, and the production goal of 107,000 tons exceeded by about 11,000 tons, as shown by the following table :—

Year.	Number of Animals Slaughtered.			
	1939–40.	1940–41.	1941–42.*	1942–43.*
Bullocks ..	175,550	159,707	155,000	166,000
Cows ..	169,328	167,183	233,000	239,000
Young cattle	61,746	64,039	66,000	72,000
Calves (bobby)	330,636	331,675	300,000	287,000
MEAT PRODUCTION—TONS.				
Beef and veal	106,148	101,623	113,000	118,000

* Estimated.

The increase in the quality of beef and veal produced during the past two years has all been due to the large slaughtering of cows, mostly dairy cows of good canning quality, and this is already being reflected in decreased dairy production.

The decrease in the slaughter of bobby calves has been brought about by the difficulty in securing transport to get them to the slaughter yards and the poor prices received. Returns have not warranted marketing the calves which have been destroyed on the farm and wasted. If these calves had been raised, it would have improved both the beef and dairy outlook this year.

There will be a big scarcity of beef as soon as dairying reaches its lowest point, and commences to increase again. The immediate prospects of beef producers are good.

The demand for cattle is expected to remain high for some considerable time, and the rearing of every strong calf is warranted.

Sheep

As there had been no worth while break in the weather in the principal sheep areas of the State up to the middle of August, it would be optimistic to predict a good season with fat lambs. Many ewes have been struggling on dry feed to provide milk for their lambs, with the result that the ewes are in poor condition, and few of the lambs will be ready to market as first quality spring lambs. Fatteners in irrigation and southern districts should be able to turn their stock over quickly, and relieve sheepowners on the dry areas of their surplus stock.

In spite of the adverse season, it should be possible to attain the goal of 150,000 tons of mutton and lamb again this season. Last year a record production of about 160,000 tons was reached without depleting the sheep population, and this season there were record matings for fat lamb production.

A Few Pigs on Every Farm

Of over 70,000 farms in Victoria, only about 20,000 keep pigs. Most farmers could raise a few pigs largely on waste products of those farms.

Pigs serve the agricultural economy best when a few are kept on each farm to salvage waste products, and only small quantities of supplementary foods have to be purchased. Most dairy farmers who sell cream keep pigs to utilize their separated milk, but among other classes of farmers only a small proportion keep pigs.

Inferior and surplus grain, and waste and unmarketable vegetables and fruit can all be cashed through pigs with advantage to individual farm incomes, and to the national larder.

The substantial manurial return from pigs should have a special appeal to vegetable growers and orchardists, a few of whom are already enthusiastic about the results of utilizing pigs to maintain soil fertility.

The present urgent need for increased pig production could be met by a fuller utilization of farm waste for pig feeding.

[L. A. Downey, H.D.A., Pig Expert.]

Prolonging the Life of Iron Roofs

The acute shortage of roofing iron and fibrous cement sheeting makes it more necessary than ever to preserve the roofing on homes and farm buildings. Galvanized roofing iron is available only in limited quantities for the catchment of drinking water. Terne coated iron also is available in very limited quantities, but it is dangerous to use terne coated iron on farm buildings because lead is dissolved in the water which it sheds. This water, lying in pools, is a source of danger to all live stock.

The life of galvanized iron roofs can be prolonged by painting them, and this can best be done by spotting the rust patches with a prime coat of metallic zinc-dust paint and then going over the whole roof with the same paint. This gives two coats to the rusty areas and one to the rest of the roof. As metallic zinc paints are almost unprocurable, the next best paint is a good brand of iron-oxide roofing paint (red-roofing paint). The usual lead-base paints are poisonous, and should not be used on roofs used as water catchments for stock and domestic purposes.

The painter should use a ladder or a plank with cleats nailed to it when working on the roof, for his own safety and to prevent damage to the iron. The end of the ladder should be provided with a brace to hang over the ridge to support it.

Frequently, after completing a painting job, a worthwhile quantity of paint remains in the tin, and if left for any length of time a thick skin forms over the top. This can be prevented by pouring a small quantity of melted paraffin over the surface. A strong cord looped through the paraffin before it hardens aids in its quick removal. The paraffin may be melted again and re-used.

Poultry

Pullets must be well reared if they are to be good egg producers. Chickens should not be left in the brooder houses for more than approximately five weeks, and then they should

be transferred gradually to clean, open range conditions to receive fresh air, sunshine, and freedom so essential for their best development. Successful rearing also depends largely on the desired strength and stamina possessed by the parent stock, from which the birds were produced, and the feeding and management of the chickens adopted during the brooding stage.

Birds, on reaching the stage of egg production, should possess the necessary constitutional vigour to maintain them in good health during the two or three years of high production (egg laying) under intensive conditions. It is just as important for the birds to be kept under very clean conditions, when running on open range, as it is during any other period of the rearing operations. Failure to do this results in the loss of many chickens each year. The area of the poultry farm should be large enough to provide about 2 acres of land for each 1,000 birds.

To reduce the risk of disease and parasitic infestation to a minimum, it would be advisable to have two areas of ground, and use each area in alternate years. This will allow the soil to sweeten and produce a fresh growth of green grass.

The usual recommendations should be adopted in feeding the birds with all the suitable foods that they can eat, including green food. Clean drinking water should be available always.

The rearing of the surplus cockerels for table purposes is advised, as they are all required for hospital patients and other essential services. The age at which birds classed as chickens are marketed varies from three to five months. The rearing of white leghorn cockerels in battery brooders has been adopted in Victoria to some extent.

When kept under the usual conditions, the rearing and feeding of the cockerels may be the same as that adopted with chickens intended for egg production, except that a little higher proportion of meatmeal, or milk, could with advantage be included in the ration to stimulate growth.

Finally, at a suitable age it is usual to give the birds a short period of intensive fattening, in fattening coops, for about two weeks, by trough feeding twice daily on wet mash only.

[H. F. Clinton, Poultry expert.]

Bees

Preparations can now be made in the warmer northern areas for replacement of queens. Colonies that have been on Banksia, and under extraction during the late autumn, will need special attention.

Many apiaries were moved in, off summer flows, and their queens will have outlived their usefulness owing to the stress placed upon them over the heavy and prolonged season. With the first flush of spring they may appear normal, but when the peak brood-rearing period arrives most of them will fail.

In the early districts of Dimboola, Nhill, and Kaniva, apiarists will be at a greater

With labour-saving machinery, grass and lucerne hay are quickly handled on Mr. G. Morton's property at Benjeroop. Hay being swept direct from the windrow (left), with a two-horse push-sweep to the rack (right), on which it is hoisted on to the stack (top).

advantage to rear queens on the spot, than wait for queens from breeders in other districts.

The ground flora of the Grampians is normal, and as a fair amount of rain has fallen along the ranges and in the valleys, a good season is expected.

Swamp Gum (*E. Ovata*) is blooming and secreting nectar freely, and colonies within reach are building up well.

A great amount of honey is consumed in the process of brood-rearing at this time of year, and at least 10 lb. of surplus stores should be on hand in each colony, as a reserve in case of bad weather.

In the southern districts, onion weed is prolific and should prove beneficial for brood-rearing to colonies supplied with stores.

Cape weed, in districts north of the Divide, is not normal on account of low rainfall, but in southern districts should prove a good asset to building up colonies during the spring.

It is well to bear in mind that five weeks elapse before the unsealed brood in the comb develops into field and honey gathering bees.

In making preparations for a flow that will commence in the middle of November, it is wise to commence stimulative brood-rearing at least eight weeks previously; that is the middle of this month.

[W. A. Collins, Apiary Inspector.]

Veterinary Notes—Grain Feeding of Sheep

Barley and other grains, such as wheat, oats, maize, &c., can be safely fed to sheep if introduced gradually to the ration. In feeding grain to sheep commence by giving 1½ oz. per head daily for the first two days, and then increase the amount by ½ oz. daily until each sheep is receiving from 4 to 8 oz. per day, which quantity is usually sufficient for the maintenance of the sheep. It is safer to feed these grains with some roughage, such as chaff, and it is important to note that when fed in quantities over a pound per day, a poisonous substance may be produced during the digestion of the grains in the stomach, particularly when fed alone. Oats are probably the safest grain to feed, but owners are advised to introduce any grain as a sheep ration with care, if they wish to avoid risk of serious losses.

It is unnecessary to crush grain before feeding to sheep.

[W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Constipation in Pigs

Reference is not made here to pigs which are incorrectly fed. Departmental pamphlets on the feeding of swine are available free of charge. Where, however, pigs are properly housed and fed, it may be found that an occasional valuable boar or sow is constipated. Treatment may not be warranted for young runty suckers, but for others treatment is well advised.

Where the pig will still take some food, it is advisable to include a purgative, such as castor oil, 2 to 4 oz., depending on size, or Epsom Salts, 2 to 4 oz., in the food. For those pigs which have lost appetite, some form of restraint is necessary to administer medicines; for suckers or weaners manual restraint is usually sufficient, while for boars or sows a rope noosed around the snout is necessary, the pig being tied up to a convenient post. For the administration of medicines by capsule, a gag is very useful together with a pair of long forceps to hold the capsule. Failing this, a metal tube, 12 inches long, connected to a length of rubber tubing, 7 inches long, of approximately ½ inch diameter, may be used as a stomach tube, the above dose of castor oil being administered in this way or of Epsom Salts dissolved in water.

The above treatment should be supplemented by rectal enemas of warm soapy water, or of liquid paraffin, this being repeated daily until the faeces are no longer hard and have regained their normal consistency.

If difficulty is experienced in drenching any particular animal, the above drugs (i.e., Epsom Salts or castor oil) may be mixed with treacle or molasses, and smeared on the tongue.

Slight exercise during and after the treatment is important.

[G. Nicol, B.V.Sc., Veterinary Officer.]

LEGUME SEED INOCULATION

Effects of Lime at Inverloch

Notes by J. BRAKE, B.Agr.Sc., Agricultural Superintendent

THE success obtained by Mr. W. Harvie Anderson in the growing of Tangier peas from inoculated seed on poor sandy soil at Inverloch, as contrasted with his failure to obtain satisfactory growth from uninoculated seed of other legumes, such as Dun peas, lucerne, and beans, led him in 1941 to seek the assistance of the Department of Agriculture in carrying out inoculation of seed tests in the hope of obtaining information which would make possible the satisfactory growing in the Inverloch district of legumes, and perhaps other crops.

The soils of this district may be divided into at least four types, all of them being highly acidic in character:—

(1) *Black, fine sandy loam,* carrying stunted tea tree and heath, and usually associated with an impervious hard pan at 6 to 12 inches below the surface. It is poorly drained and very acid in reaction (pH value 4·9). There is an extensive area of this type in South Gippsland.

(2) *Black silty loam,* occurring on "swamp paper bark" flats. It also is badly drained and very acid in reaction (pH value 4·9), but will carry good crops and pasture when drained.

(3) *Dark brownish-grey clay loam,* occurring as plain country carrying "fescue tussock" grass. It has a higher degree of potential fertility than the other types and a somewhat less acid reaction (pH value 5·7).

(4) *Grey sand,* occurring on hill tops and high land and carrying a mixed growth of messmate, peppermint, bracken, and other low-growing scrub. It is a poor sand, extremely acid in reaction (pH value 4·4).

Mr. H. A. J. Pittman, B.Agr.Sc., Dip. Ed., Plant Pathologist, of this Department, was deputed to undertake the inoculation trials, and commenced them on Mr. Anderson's property on soil of type 4, the site of the plots being virgin land cleared immediately before sowing. The soil on this site may be described as a very poor dark sand, high in humus with a large quantity of decaying twigs and other vegetable matter, and very deficient in plant food generally. The pH varies from 4·7 to 4·4, so that it is very acidic in character.

As it was already known that a high degree of acidity is unfavourable to the action of nitrogen-fixing bacteria, basic superphosphate was used as the standard fertilizer. This was made by mixing, several days before sowing, one part by weight of dry, freshly air-slaked lime with five parts by weight of superphosphate.

A preliminary germination test with Navy beans was planted on 6th October, 1941, using inoculated and uninoculated seed and three different fertilizer applications—basic superphosphate, superphosphate, and superphosphate + sulphate of ammonia (2:1), each applied at the rate of 3 cwt. per acre.

On 27th October, a germination count was made which did not disclose any great advantage from inoculation, but showed a germination on the basic superphosphate plots approximately twice and four times as good as that of the superphosphate and superphosphate + ammonia plots respectively.

A sowing of inoculated Bacchus Marsh subterranean clover with the same fertilizer treatments as before gave a germination result even more in favour of basic superphosphate.

On 28th October, 1941, in view of the results obtained above, a further test was laid down in triplicate with the same fertilizer treatments, but using Mt. Barker subterranean clover, inoculated and uninoculated.

The early growth of these plots showed up greatly in favour of basic superphosphate, but it was not possible to obtain final figures in

respect of germination or yield, because the plants died owing to the very dry conditions which prevailed in November.

Influence of Lime

In view of the beneficial effect which the addition of lime to the superphosphate appeared to have, not only on the germination, as mentioned above, but also on the formation of nodules and on subsequent growth of the plants, a test was laid down in May of the following year—1942—with the object of determining to what extent the lime could be increased with advantage in the lime-superphosphate mixture. In this test inoculated and uninoculated Mt. Barker subterranean clover seed was planted, the fertilizers used being as follow, with the mixtures proportioned by weight:—

(*a*) Superphosphate only
(*b*) Lime 1 + superphosphate 5
(*c*) Lime 3 + superphosphate 5
(*d*) Lime 5 + superphosphate 5
(*e*) Lime 5 + superphosphate 3
(*f*) Lime 5 + superphosphate 1
(*g*) Lime only.

The lime and superphosphate mixtures were prepared ten days before planting, and all dressings were applied at the rate of 1½ cwt. per acre mixed with the seed on the 30th May, 1942.

The plots which had received high proportions of lime again showed up very favourably as compared with the others.

Some evidence of advantage in the use of a lime-superphosphate mixture was also observed in top-dressing pasture on Mr. Anderson's property on a soil intermediate between types Nos. 3 and 4, and also on a soil of No. 1 type on the property of Mr. Metherall.

The Agricultural Research Chemist (Mr. Jewell), who has carried out analyses of the soils referred to, states that, "with the exception of type No. 3, they are characterized by a very low phosphoric acid content, and an extremely acidic reaction. The degree of acidity is so great that, in itself, it is possibly sufficient to account for better results being obtained with lime-superphosphate mixtures than with superphosphate alone."

The virtue of the lime plus superphosphate treatment, as apparently found beneficial at Inverloch, probably lies in the action of the lime in reducing the acidity of the soil in the immediate root zone of the plant. This has a limited application, however, throughout the State, because soils generally are not excessively acidic.

Over a period of years the Department of Agriculture has conducted top-dressing tests with lime plus superphosphate, and also with basic superphosphate on pastures in many districts of the State. In these tests, which were not on highly acidic soils, but on average quality agricultural land, and which extended from Hamilton in the west to Korumburra in the east, and Benalla in the north-east, basic superphosphate was almost invariably inferior to superphosphate.

In some districts of Victoria, particularly in the red hill country of Gippsland and on some silurian soils in Central Victoria, lime plus superphosphate has given better results than superphosphate alone, but in many cases the cost involved would render the use of lime unprofitable.

It may be expected that further work will serve to confirm lime and superphosphate mixtures as effective for highly acidic soils, similar to those of Inverloch, for top-dressing of legumes or grass and legume pastures, and also in the sowing down of legumes and other crops.

In order to obtain further evidence, it has been decided to proceed with the establishment of several replicated experimental plots, comparing various mixtures of lime and superphosphate used with both inoculated and uninoculated seed.

The first of these is being established in the Inverloch-Wonthaggi area on the properties of Mr. W. Harvie Anderson, on soil type No. 3, and of Mr. Metherall on soil No. 1. The results should be of interest and possibly have considerable value in respect to a fair scope of country in South Gippsland at present more or less unproductive.

A GOOD HAY-STACK THE BEST INSURANCE AGAINST SHORTAGE

Burnley Egg-Laying Competition

Results of Winter Test

By H. F. CLINTON, Poultry Expert

THE thirty-third Egg-Laying Competition for fowls, conducted by the Department of Agriculture, at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1943, and will continue until 1st March, 1944, a period of 48 weeks.

The competition, this year, is limited to the section for Individual Birds—Single Test, as in the previous competition.

The winter test, conducted in connexion with this competition, included the first four months (122 days), and concluded on the 31st July last. Ehis test is held annually, for the purpose of giving prominence to birds that lay well during this period, when prices of eggs are high. In this test, certificates are awarded for the greatest number of first-grade eggs laid by individual birds in all classes, provided that a bird lays 60 first-grade eggs. During the first two months, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

It is pleasing to note that the eggs laid by the prize winning birds were practically all first-grade, as was the case last year. Some very high scores were recorded. In the 122 days of the test, a White Leghorn, six Australorps, and a Rhode Island Red, each laid 100 first-grade eggs or more, and in all classes of the competition, twenty other birds each laid 90 first-grade eggs or more. The highest number of first-grade eggs laid by a bird in all classes of the competition, was recorded by an Australorp, owned by the Sunrise Poultry Farm (G. A. Manallack). This bird laid 112 eggs, all of which were first grade.

Rhode Island Reds are again well represented in the competition, with a total of 36 birds. Many birds of this excellent table breed, and also other breeds, which were entered, could not be accepted owing to insufficient pens being available. Some excellent scores were recorded for Rhode Island Reds. A bird of this breed, owned by Mr. A. Perkins, laid 100 eggs, all first grade, in the 122 days of the test.

Langshans are represented by an entry of eight birds. A bird of this breed, owned by Mr. R. D. Wilson (Willoyse Poultry Farm), New South Wales, laid 95 eggs, all first grade.

The relative merits of the wet and dry mash systems of feeding have always been a subject for discussion, therefore, Table I, showing the number of eggs laid by each of the winning birds in the classes for White Leghorns, compared with those of the three previous years, will be of interest. The figures would indicate that much depends on the laying capacity of the birds themselves.

Individual Birds—Single Test

In the class for White Leghorns fed on wet mash, Mr. T. L. Eastaugh won first prize with a bird that laid 100 eggs, all first grade. Mr. W. J. Cooke gained second prize with a bird that laid 95 eggs, and Messrs. T. L. Eastaugh,

TABLE I.

	1940.			1941.			1942.			1943.		
	Total Eggs.	Under Weight.	First Grade Eggs.	Total Eggs.	Under Weight.	First Grade Eggs.	Total Eggs.	Under Weight.	First Grade Eggs.	Total Eggs.	Under Weight.	First Grade Eggs.
Wet mash ..	94	1	93	103	..	103	93	..	93	100	..	100
Dry mash ..	88	..	88	111	..	111	108	1	107	95	..	95

and J. Aitken (Avonlea Stud Poultry Farm), were equal third, each of their birds having laid 91 eggs.

In the White Leghorn class, fed on dry mash, first prize went to a bird owned by Miss M. Martin with a total of 95 eggs, all first grade. Mr. K. C. McKenzie gained second prize with a bird that laid 92 eggs, and Mr. D. J. Sutherland's bird was third with 88 eggs.

In the class for Australorps, the Sunrise Poultry Farm (G. A. Manallack), won first prize with a bird that laid 112 eggs, all first grade. Mr. R. A. Wilson gained second prize with a bird that laid 106 eggs, and Mrs. J. Cornish's entry was third with 105 eggs.

Mr. A. Perkins obtained first prize in the class for Rhode Island Reds, with a bird that laid 100 eggs, all first grade. Equal second prizes were awarded to Messrs. A. Perkins, G. Winter, and T. A. Pettigrove, each of their birds having laid 94 eggs.

First prize in the class for all heavy breeds, other than Australorps and Rhode Island Reds, was awarded to Mr. R. D. Wilson (Willoyse Poultry Farm), New South Wales, whose Langshan laid 95 eggs, all first grade. Mr. B. H. Leonard gained second prize with a Light Sussex that laid 87 eggs, and Mrs. E. J. Cooke secured third prize with a Langshan that laid 64 eggs.

PRIZE LIST

INDIVIDUAL BIRDS—SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.				
First Prize—Champion Certificate.				
171	T. L. Eastaugh, Point Nepean-road, Highett, S.21	100	..	100
Second Prize—Government Certificate.				
123	W. J. Cooke, 8 Mount-street, West Preston, N.18	95	..	95
Equal Third Prize—Government Certificate.				
172	T. L. Eastaugh, Point Nepean-road, Highett, S.21	91	..	91
151	Avonlea Stud Poultry Farm (J. Aitken), Silver-street, Cheltenham, S.22	98	7	91
Class 2.—White Leghorns—Dry Mash.				
First Prize—Champion Certificate.				
232	Miss M. Martin, 23 Clonaig-street, Brighton East, S.6	95	..	95
Second Prize—Government Certificate.				
227	K. C. McKenzie, 82 Clarence-street, Geelong West	94	2	92
Third Prize—Government Certificate.				
224	D. J. Sutherland, Wilson-street, Cheltenham, S.22	88	..	88
Class 4.—Australorps—Wet Mash.				
First Prize—Champion Certificate.				
19	Sunrise Poultry Farm (G. A. Manallack), Lockwood-road, Kangaroo Flat	112	..	112
Second Prize—Government Certificate.				
23	R. A. Wilson (Braeburn Poultry Farm), Duncan's-road, Werribee	106	..	106

INDIVIDUAL BIRDS—SINGLE TEST.—*continued.*

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
Class 4—Australorps—Wet Mash.—*continued.*				
Third Prize—Government Certificate.				
53	Mrs. J. T. Cornish, Healesville	105	..	105
Class 5.—Rhode Island Reds—Wet Mash.				
First Prize—Champion Certificate.				
72	A. Perkins, 5 Eastgate-street, Pascoe Vale South, W.7	100	..	100
Equal Second Prize—Government Certificate.				
74	A. Perkins, 5 Eastgate-street, Pascoe Vale South, W.7	97	3	94
75	G. Winter, "Denehurst," Murgheboluc	94	..	94
92	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	94	..	94
Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.				
First Prize—Champion Certificate.				
68	R. D. Wilson (Willoyse Poultry Farm), St. Ive's, Pymble, New South Wales (Langshan)	95	..	95
Second Prize—Government Certificate.				
59	B. H. Leonard, Bracknell, Tasmania (Light Sussex)	87	..	87
Third Prize—Government Certificate.				
62	Mrs. E. J. Cooke, 8 Mount-street, West Preston, N.18 (Langshan)	66	2	64

IN THE ORCHARD

Contributed by the Horticultural Division

A passion fruit plantation at Pakenham Upper.

Trellising Passion Fruit Vines

SUCCESSFUL production of passion fruit is dependent on careful attention to trellising. Not only does this have an effect on yield, but also on the longevity and freedom from disease of the vine.

It is generally considered that the distance between trellises should be 12 feet, while the distance between vines in each row should be 18 feet. End posts of the trellis should be at least 3 ft. 6 in. in the ground and stayed so that they will support the tightly strained wires. Intermediate posts should be 2 ft. 6 in. in the ground and 18 feet apart. Four to five wires would be sufficient to support the vines.

The best time for planting young vines is during late September or early November. During the first season's growth, the plants should be tied to a stake in order to guide the growth to the bottom wire.

In training a vine, the object should be to secure a fan-shaped framework with arms radiating from a single main stem, at a point at least 6 inches above ground level. It is important that all growth arising below this point be removed and the main stem kept free from fallen debris, so that conditions favorable to collar rot will not arise. After the first season's growth, therefore, all lateral growths below 6 inches should be removed. Shoots on the young vine should be selected and tied in suitable positions to the trellis to form the basic fan-shaped framework.

The object in pruning a vine for the first three or four years is to establish the framework by removing superfluous growths, selecting and training the leaders in the required direction.

Pruning of mature vines consists of removing diseased or dead growth, cutting out unfruitful laterals and replacing the less vigorous leaders with new growth. Growth hanging low to the ground should be removed. If any vines show signs of the virus disease causing crinkling of the leaves and "woodiness" in the fruit, they should be destroyed by cutting the main stem off at ground level. The diseased vine should be allowed to die out and removed when dry so that the infection will not spread to other vines. If any infection is noticed in the plantation, growers should take the precaution of wiping the secateurs with soapy water after each vine is pruned. The best time for pruning is after the last spring frosts so that any frost damaged laterals can be removed and the resultant fresh growth will not be damaged.

Re-working Fruit Trees

The following hints are given on the re-working of fruit trees. During the present month, a start may be made on this work and it may be continued until early November.

It is assumed that sufficient grafting wood of the required varieties has been collected and heeled into the ground during the winter. Should this wood show any signs of growth it should be removed for a couple of days and then replaced until it is needed. Grafting wood showing any sign of shrivelling may be stood in water until it revives.

One of the essentials for successful re-working is to secure a good grafting knife with a keen flat ground edge. This will ensure clean straight cuts on the scions. There are two methods used for re-working trees. "Top-working" is the term given to the method whereby the main arms are removed to within a few feet of the ground; while in "frame-working," most side growths and spurs are removed but the main limbs are retained. A few spurs are left, especially on the north-west side of the tree as a protection for the limbs against sun scald.

The best graft to use for top-working limbs more than 1 inch in diameter is the strap graft. This graft provides ample callousing material to cover the old limb fairly rapidly, and so protect it against wood-rotting fungi. When the limbs are sawn off, the cut surfaces should be trimmed with a spokeshave or sharp knife to assist the growth of the callous tissue.

In frame-working a tree, if any of the various forms of bark grafting are to be used, such as the "T," "L," gouge, or needle grafts, it is essential that growth should have commenced in the tree so that the bark will lift freely.

The needle graft is probably the quickest and easiest bark graft to perform. The tool is a packing needle which has had ¼ inch of the point removed, and the squared end is then sharpened. The eye of the needle is removed and the tool is then inserted into a handle.

The scions for re-working should not be thicker than a lead pencil because thick scions cause the bark to split. When the scions are cut it is advisable to have at least three buds so that if the top one is injured, lower ones will come away satisfactorily. Scions should be cut carefully and cleanly to a sloping wedge shape in order that there will be a large area of contact between the surfaces of stock and scion.

When the needle is inserted into the limb of the tree, it is necessary to make certain that the bark is completely penetrated. The needle is then partly withdrawn and used as a lever to keep the bark raised until the scion is inserted.

This graft may be sealed with suitable wax, no tying being necessary. Complete coverage around the graft is necessary in order to ensure success. Regular inspections twice a week for a month after grafting should be made and any cracked wax resealed.

Fresh growth from scions in top-worked trees should be protected from wind damage by tying to stakes nailed on the trunk or branches of the original tree.

For more detailed information on this subject, a booklet entitled "Budding and Grafting Fruit Trees" is available for 1s., including postage, on application to the Director of Agriculture, Treasury Gardens, Melbourne, C.2.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

The Zinnia

THE zinnia has returned to favour largely because of the improvements which the flower breeder has brought about. It likes hot, dry weather, plenty of sunshine, rich soil and regular watering. The range of bright colours, its long flowering season and value as a cut-flower are its chief characteristics.

It is advisable to delay sowing until the weather is warm, otherwise a poor germination will be obtained, and the small seedlings will be stunted and may even die. To obtain early plants, sow the seed in seed-boxes, towards the end of September and during October. Place these seed-boxes in a sunny position where they will be protected from any late frosts.

Prepare the beds, in which it is intended to plant zinnias, by digging in well-rotted manure. They are surface rooting plants which form a rather dense mass of roots in a small area, and therefore require a rich soil. When transplanting, space the dwarf types such as *Z. lincaris* and

Z. Haageana from 8 to 12 inches apart, and the tall-growing, large-flowered types of *Z. elegans*, such as the Giant Dahlia-flowered and Giant Double, about 18 inches apart.

The dwarf types can be used for bedding or for borders. They grow to a height of 12 to 18 inches and are noted for their free-flowering in the summer and autumn and even up to the time when winter frosts stop their growth. *Z. linearis* has bright golden and yellow flowers, while the flowers of *Z. Haageana* are rose tipped with yellow, maroon tipped with cream, wallflower-red tipped with yellow and so on. The Lilliput or Pompone Zinnia also belongs to this dwarf type. The flowers resemble miniature zinnias, and the colours correspond to those of the large-flowered strains.

The Giant Dahlia-flowered, and Giant Double types have flowers 6 inches, and 4 to 5 inches, in diameter, respectively, produced on long stems which make them valuable for cutting. They can be planted for bedding effects, or in clumps amongst other annuals and perennials. Mixed and self colours are available. Varieties of the Dahlia-flowered type are **Golden Dawn, Purple Prince, Exquisite** (light rose), **Crimson Monarch, Giant Attraction** (brick red), **Oriole** (orange and gold), **Meteor** (deep red) and **Canary Bird** (a clear, rich yellow).

The Giant Double types grow to a height of about 3 feet, and produce a wealth of blooms. Mixed and separate colours are available also in this type. Varieties are **Crimson, Sulphur Yellow, White, Flesh, Apricot, Buff, Deep Rose** and **Burnt Orange.**

During summer, apply a mulch of well-decayed manure, or compost, and give frequent waterings with diluted liquid manure. Dust the underside of the leaves with flowers of sulphur, if Red Spider attacks the plants.

Eschscholtzia

Many gardeners prefer to call Eschscholtzia, the California Poppy or Gold Cups. It is the State Flower of California. It is a useful subject for a hot, dry part of the garden, and is quite at home in a stony soil where very few other plants would survive. The flowers are exceedingly bright and include scarlet, crimson, white and gold. The texture of the flowers is like satin. They grow to a height of 12 inches and have a rather spreading habit of growth. They are not easily transplanted, and it is better to sow the seed in late spring, where the plants are to remain. The seed is very fine and should be just covered with soil, and a light covering of sieved manure placed over it to retain the moisture in the surface soil until the seed germinates.

Scabiosa

Very frequently, Scabiosa is called "Sweet Scabious" or "Pincushions." Many of them are best treated as annuals, although they are perennials. The flowers are fragrant and include a large range of colours—white, pink, purple, blue and lavender. Scabiosa makes a good display in the garden, blooming from early summer until frosts occur. In addition, it is an excellent cut-flower.

It grows to a height of about 2 feet. Seed should be sown now in seed-boxes, and covered with ½ inch of sandy soil. When transplanting seedlings, space the plants 1 foot apart. It is advisable to provide light stakes, or other means of support, for the plants.

The following are treated as annual varieties, and include many pleasing colours—**Peach Blossom, Shasta** (white), **Azure Fairy** (rich, lavender blue), **Cherry Red** and **Salmon.**

Scabiosa columbria, with its delicate lilac-pink flowers, is popular with florists, and is treated as a perennial, as is also **S. caucasia.** The Isaac House hybrids, of the latter species, are popular and contain flowers of various shades of lavender and blue.

THE VEGETABLE GARDEN

This month is a very active one in the vegetable garden. Seed sowing of many vegetables, in seed-beds or in the permanent beds, can now be commenced, and beds should be prepared for seedlings and for later crops, such as tomatoes and pumpkins.

Cabbage

Seed of any of the following varieties of cabbage can be sown in a seed-bed this month—**Golden Acre, Copenhagen Market, St. John's Day, Early Jersey Wakefield,** and **Henderson's Succession.** Do not sow the seed too thickly, otherwise spindly seedlings will be the result. Cover to a depth of about ½ inch with sandy soil. Grow the seedlings slowly, and remember that sturdy seedlings always transplant more satisfactorily than quick-grown, weak plants. The seedlings in the seed-bed will require to be protected from the Cabbage Moth and the Cabbage White Butterfly by dusting or spraying with arsenate of lead.

Broccoli

More interest has been taken of late in Broccoli which resembles the cauliflower in many ways. It is considered to be a variety of cauliflower, and the heading type of Broccoli resembles

our cauliflower very closely, but the sprouting type is quite distinct. This latter type has longer stalks, with many, more or less distinct, small cauliflower-like heads on each plant. The leaves are also more elongated than the leaves of our cauliflower, and usually the plants take longer to mature. Broccoli can withstand cold conditions much better than cauliflower. The first heads of the sprouting types may be cut when mature, and then further heads will be produced in the axils of the leaves. There are green and purple varieties of the sprouting type.

Seed of Broccoli may be sown now in seed-beds, or seed-boxes, in much the same way as the cabbage seed above. When large enough, the seedlings should be transplanted to a thoroughly prepared bed which has been previously well-manured and limed. Space the plants about 2 feet apart, in rows from 2 to 3 feet apart. This crop, being a very close relative of the cabbage and cauliflower, will need the same protection against insect pests.

Spinach

Spinach is a quick-maturing crop which provides valuable greens in spring and autumn. At this time of the year the Round Seeded or Summer variety is sown, in drills, in the beds where it will remain. Space the drills, or rows, 18 inches apart and sow about 10 seeds per foot. Gently press the seed into the soil and cover with about ½ in. of fine sandy soil. When the young plants are large enough to handle, thin them out to about 6 inches apart. Spinach requires a rich, well-drained soil and an occasional application of nitrate of soda at the rate of ½ to 1 oz. per square yard, or this fertilizer may be dissolved in water at the rate of 1 oz. per gallon, and the plants watered once a fortnight after the young plants commence growth.

Lettuce

Seed of Iceberg or Mignonette varieties of lettuce can be sown now, either in seed-beds or in permanent drills in the garden bed. The drills should be about 15 to 18 inches apart, and the plants thinned to about 1 foot apart.

Tomatoes

Early this month, sow seed of **Burwood Wonder, South Australian Dwarf, Tatura Dwarf Globe, Red Marhio** or **Salad's Special** in seed-boxes. Choose a good, sandy loam soil for filling the seed-box, and scatter the seed thinly; press firmly into the soil and cover with ¼ inch of sandy soil. Place in a warm, sunny position sheltered from frosts, and water regularly. A sheet of glass placed over the seed-box, until the seed germinates, will be found beneficial. After germination it should be removed, otherwise the seedlings will be drawn.

Carrots, Parsnips, &c.

Seed of carrot, parsnip, red beet and white turnip, can be sown in drills in the garden bed this month. Potato tubers also, may be planted. Detailed particulars of the sowing and planting of these crops, have appeared in these notes in previous numbers of the *Journal*.

Roundworms in Poultry

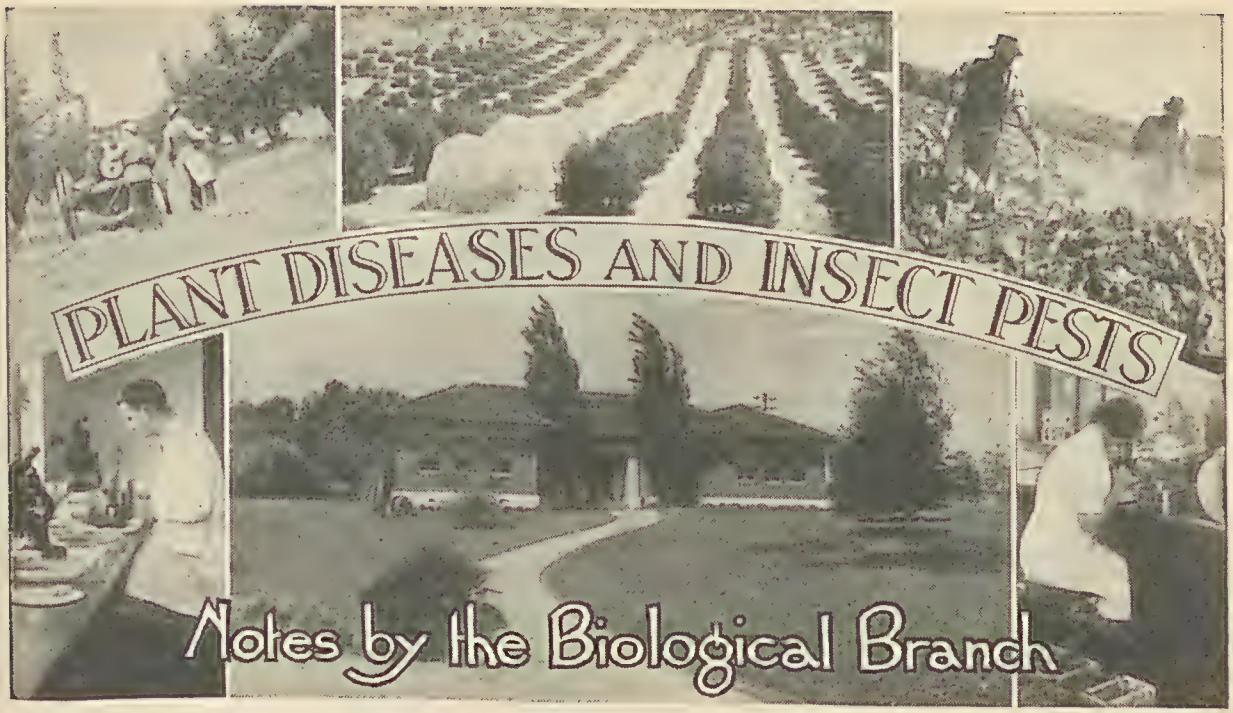
The roundworm of poultry occurs in the small intestine of the fowl, and is an appreciable source of loss to the industry.

On examining a killed fowl, a few of these parasites, measuring up to four inches in length, may be found in the small intestine, although the bird may have appeared quite healthy. However, such a bird contaminates the ground with its droppings, which contain worm eggs. These eggs normally infect more poultry. Chickens under two months, if they pick up a heavy infestation, are very susceptible. Symptoms such as sluggishness, loss of appetite, drooping of wings and ruffled feathers are then likely to be seen, progressing to emaciation and possibly death of some birds.

To combat the parasite, it is wise to pay attention to drainage of fowl yards and cleanliness of fowl houses and brooders.

Affected birds may be treated by the addition of nicotine sulphate or phenothiazine to the mash. Most effective of all is individual treatment with carbon tetrachloride. Care is necessary in all three of these treatments. The correct procedure will be described on application to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

[Contributed by the Live Stock Division.]



PSOROSIS OR SCALY BARK OF CITRUS

The disease known as Psorosis or Scaly Bark of Citrus is not common in Victoria. This is a fortunate circumstance as it is regarded as the most serious of all diseases affecting citrus in some of the large citrus growing countries overseas. However, a few affected trees are known to exist in the Murray irrigation area and, therefore, growers should make sure the disease is not present in their block, and if it is detected they should eradicate the affected trees.

The disease affects the bark of the trunk or main branches of the tree. The affected bark becomes scaly and peels off in small flakes. The diseased area gradually becomes larger and extends into deeper layers of the bark. Finally, the limb or trunk may be girdled and then the portion of the tree beyond dies. The disease develops slowly and the symptoms described do not usually develop in trees under ten years old, although the trouble has probably been present in the tree ever since its propagation. Sweet oranges, mandarins, and grape fruit are susceptible to the disease, while sour oranges and lemons are highly resistant.

The disease is thought to be caused by a virus. Viruses are disease-producing agents of such small size that they are not visible under the highest magnification of the ordinary microscope. They also pass through filters, which would retain visible disease producing agents such as bacteria and fungi. Some viruses are transmitted by contact between diseased and healthy plants, or by sucking insects such as aphids and thrips. Others can only be transmitted by budding or grafting a portion of an infected tree into a healthy stock. Psorosis apparently falls into this third class.

Control

Some success in controlling the disease by scraping off the diseased bark has been reported in America. However, workers in other countries, such as South Africa, have not found this method

Psorosis or "Scaly Bark" of citrus.

satisfactory, and have suggested that eradication is probably the cheapest control in the long run. Certainly, eradication of affected trees would be the wisest course to follow in Victoria, as the number of trees involved is small, and while they remain they are a potential danger to the industry.

After an infected tree has been removed, it will be quite safe to replant immediately on the same site, as the disease is not carried in the soil.

BLACKLEG OF BEET

Most commercial growers are familiar with a seedling disease of the cabbage and cauliflower family, commonly referred to as Blackleg. Few growers, however, are acquainted with a similar disease of red beet, silver beet, and sugar beet which is identically named. These diseases are caused by two closely related fungal parasites. The beet parasite (*Phoma betae*) is incapable of attacking plants of the cabbage family and the cabbage parasite (*Phoma lingam*) will not infect beet. Both parasites are seed-borne.

When infected beet seed is sown, the young plants may be destroyed before they emerge from the soil. This phase of the disease is most prevalent when cold wet soil conditions, unfavorable for rapid germination, occur. Seedlings may also be attacked in the lower stem and root regions at or below ground-level. The infected stem constricts and turns black and the plant deprived of its food and water supply, wilts and dies.

The seeds of these three red beet seedlings were sown on the same day. The two small seedlings at right with their constricted stems infected with *Phoma betae*, contrast sharply with the healthy plant at left.

A few infected seedlings may survive, but they usually make poor growth and are liable to be killed by the fungus at any time. In summer it is quite a common occurrence to find a small percentage of almost mature wilted plants in any field of red beet. When pulled, these plants leave the soil very readily because their tap-roots have been destroyed by the fungus.

Blackleg of beet is a serious disease which is becoming increasingly important in Victoria, whereas its close relative, Blackleg of crucifers, is now of minor importance.

The disease is insidious in nature because growers fail to realize that the frequently poor germination of beet seed is largely due to a seed-borne disease. Practically every sample of beet seed is infected with *Phoma betae* and, as the disease is world-wide in distribution, imported seed as well as locally produced seed is likely to be infected.

As a general rule, the damper the district in which the seed is produced the higher the percentage of infected seed. The majority of red and silver beet seed crops grown in Southern Victoria in the 1942–43 season were infected to a varying degree with the fungus. Seed from one red-beet crop was heavily infected. When samples of seed from this crop were sown under experimental conditions, a high percentage (up to 80 per cent.) of the seedlings was destroyed by the fungus.

Control

Seed Treatment—Whereas infected seed of the cabbage family can be " disinfected " very easily by immersion in water at 122° F. for 30 minutes, no really effective treatment has been developed which will eradicate the fungus from beet seed. However, seed treatment with an organic mercury dust, at the rate of one level teaspoon per lb. of seed, will increase the emergence of beet seed. The seed should be enclosed in a lidded container and shaken vigorously for several minutes with the requisite amount of dust. There are two proprietary brands of organic mercury dusts available at the present time.

Crop Rotation—A rotational system should be practised which allows an interval of two or three years between beet crops, because the fungus may persist for a considerable time in the soil in the refuse from a previous crop.

" DAMPING-OFF " DISEASE OF FLAX

" Damping off " is a seedling disease of flax which has occurred to a limited extent in Victoria in the past two seasons. The disease is caused

by the soil fungus, *Pythium* sp., and is encouraged by any condition which delays the emergence and early growth of the seedlings. Such conditions are excessive soil moisture, cold weather, deep sowing in heavy acid soils, and the setting of the surface of clay or silty soils following heavy rain in the period between sowing and germination. The disease is characterized by reddish-tan to brick-red discolorations on the cotyledons or the young roots of the affected seedling. In severe cases the cotyledons and roots rot completely before the seedling emerges from the ground. Usually, however, the cotyledons are not completely destroyed and the first true leaves are healthy. Where the tip of the young root has been rotted, it often happens that the plant recovers by sending out secondary roots from above the affected area. In such cases, however, the early growth of the plant is retarded.

The adult codling moth (*Cydia pomonella* L.) (*Enlarged.*)

CODLING MOTH OF PEARS

Early in October, pear growers will be commencing their seasonal spray applications against the codling moth. Investigations of the problem, conducted by the Biological Branch, have shown the following factors to be of major importance in determining the success of any campaign against this pest:—

1. The calyx spray must be applied at petal fall and not delayed simply because the calyces of pears do not close rapidly.
2. Cover sprays, to be effective, must be applied prior to periods of maximum egg hatching. Until it is possible to make general use of more accurate methods of forecasting these periods, lure records must be relied on as a basis for timing sprays. Lures, however, should be examined at least twice each week and growers will need spray equipment of sufficient capacity to complete spray applications within five to seven days of the period of maximum egg laying.
3. Thorough spraying means that each tree must be thoroughly wetted, particular attention being paid to the top and centre of the tree.
4. Lead arsenate–white oil mixtures are more effective than lead arsenate in controlling codling moth. These combination sprays should consist of lead arsenate paste 5 lb. or powder 2½ lb. plus 4 pints of white oil emulsion in 80 gallons of water. Some growers have been deterred from using such combination sprays because of "flocculation" which occurs in the spray vat when certain brands of lead arsenate are mixed with certain types of oil. This "flocculation" consists of the formation of large flakes throughout the water phase. Each flake is a mass of oil droplets coated with lead arsenate particles. It has been determined, however, that unless the agitation is so poor as to allow settling, this purely physical phenomenon of "flocculation" has little bearing on the actual spray deposit achieved. The practice of using spreaders either in such combination sprays to prevent "flocculation," or in codling sprays generally, will result in lowered spray deposits and consequently inferior control.
5. Every effort should be made to eliminate the first brood. By so doing, there is little danger of severe second brood attack and in many cases second brood sprays may not be necessary. In order to achieve this, however, orchardists must pay strict attention to the factors already discussed. While infestations vary greatly from one orchard to the next, most growers would be well advised to use the lead arsenate–white oil combination sprays for at least the two sprays following the calyx spray, (i.e., the first and second cover sprays) if a high degree of control of first brood grubs is desired. Where severe infestations have been experienced in the past, each spray, including the calyx spray, should consist of lead arsenate–white oil mixtures, until the infestation has been reduced.

Where banding is deemed necessary a larger number of grubs will be trapped in hessian than in chemically treated bands. Bands should be in place by the end of November, and hessian bands should be examined every ten days subsequently. In general, however, and particularly when labour is scarce, banding is of secondary importance when compared to spraying, and a closer application to the principles of spraying already outlined will yield better results than time spent in banding.

CUTWORMS

Damage by cutworms is of three general types. That most widely experienced is probably the cutting down over-night of recently transplanted seedlings. Often a portion of the fallen plant may be consumed as well, but more often the stem only is eaten, either partly or completely, through. The culprit may usually be found coiled up beneath soil level at the base of the destroyed plant.

Next of importance in the garden is the damage to foliage, in which case the caterpillar species involved climbs over the plants; lettuce, cabbage, mint, beet, &c.; and eats out big holes in the leaves.

An adult cutworm moth (*Heliothis obsoleta* Fabr.). (*Enlarged.*)

The third type of damage is that in which the caterpillar attacks the developing fruit or seed head, as with tomatoes, plums and apricots, or ripening cereal crops.

Life Cycle

In Victoria, there appears to be continuous breeding of some species of cutworms, although with all kinds, spring broods of moths are usually the most numerous. Growth rate of the larvae is faster in summer than in winter. Winter emergence of moths is limited to occasional very warm days. Pastures, grassy headlands and weedy areas are breeding grounds which carry the pest over between crops.

Typical cutworm larvae (enlarged). During the day they may be found coiled up in the soil, as shown in the lower illustration.

Many of the autumn caterpillars, on becoming fully grown, form reddish-brown chrysalids in or on the soil, and emerge as moths in September. These distribute eggs at the rate of several hundreds per female, over a wide range of food material suitable for the caterpillars. In five to ten days, according to temperature, the eggs hatch and any damage caused becomes more readily noticeable as the feeding caterpillars increase in size.

Control

Nature effects a valuable biological control of cutworms by means of parasitic wasps which kill off many larvae or chrysalids before they transform into moths. Those escaping, however, still have to be dealt with by cultural and chemical methods. The expenditure on control is usually governed by the amount of damage caused and the value per unit area of the crop concerned.

Cultural control consists of timely ploughing in of crop residues and weed growth before replanting the field. Headland growth should be mown short or kept growth-free in very susceptible areas. These methods destroy much food and shelter and kill many insects in the caterpillar and crysalis stages. Maize should not be planted close to tomatoes, unless purely as a trap crop to be regularly sprayed or dusted with poison.

Chemical control consists of either scattering poison bait, spraying or dusting the crop with poison, or a combination of all three methods. Where cutworm-infested weedy or grass land is to be ploughed and sown in spring without a resting interval, it is a protection for the crop to precede transplanting of seedlings by distributing

all over the field a bait of chopped green stuff or bran, poisoned with sodium arsenite. The formula is as follows:—

Bran	25 lb.
Salt	½ lb.
Sodium arsenite ..	¾ lb.
Water	2½ gallons.

Dissolve the salt and sodium arsenite in one gallon of the water before mixing with the bran, then add as much of the balance as is required to make the bran crumbly, flaky, but damp. An equal well pressed volume of chopped green vegetable may be used instead of bran. Paris green 1 lb. or lead arsenate 1½ lb., instead of sodium arsenite, may be used with bran, or either dusted or sprayed on the green stuff. Paris green and lead arsenate are mixed dry with the bran, water being added afterwards.

Headlands could be given, if necessary, an extra baiting where these and herbage in adjacent fields are known to carry cutworms. Distribution at the rate of 10 to 25 lb. of dry bran per acre will be needed, using the lower rate on smooth surfaces.

Bait should also be placed along the plant rows, preferably in the late afternoon, to prevent too rapid drying out which causes loss of palatability.

Over-wet bran loses attractiveness more quickly than when it is quite friable. Paris green or lead arsenate is preferable to sodium arsenite (a plant poison) for bait which comes into contact with the plants.

Spraying with lead arsenate, using 1 lb. of powder or 2 lb. of paste in 20 gallons of water, will protect seedlings. Repetition will be necessary throughout the growth of the crop, the frequency depending on the intensity of the district's cutworm population.

Dusting with 50 per cent. lead arsenate powder and 50 per cent. of prepared clay or hydrated lime will usually afford equal protection and is more easily applied than a spray. This mixture may be prepared on the farm or obtained ready for use from a manufacturer of insecticidal dusts.

BROWN VEGETABLE WEEVIL

The adults of this weevil often kill out whole fields of tomatoes in the first two weeks after transplanting.

Carrot crops also are very liable to be eaten off completely in the seedling stage where the precaution of distributing poison bait has been omitted.

One or two baitings with poisoned bran, and at least one lead arsenate dusting or spraying of the young seedlings or transplants should be regarded as necessary routine steps in most tomato growing areas and for some carrot growing districts.

In view of the present urgent need for vegetable foods, it would be well not to allow the pests to "get in first", but to anticipate their arrival as recommended above.

MILLIPEDES

The millipede, *Myriapoda*, is characterized by its many legs and is often mistaken for an insect larva. However, its body which is smooth-surfaced, is also many-jointed, and each segment after the first three, carries two pairs of legs. The first three segments each have one pair of legs. Antennae are present as with insects. When handled, it often coils up into a tight, flat spiral.

The millipede deposits small, round eggs, about 60 at a time, in a small earthen cell. These hatch and the larvae feed on rotting vegetation or on the roots of plants.

Damage

Where present in great numbers and in damp situations, millipedes often turn their attention to corms, tubers, bulbs and soft-stemmed seedlings, boring into the former and ring barking the latter.

Control

Rotting heaps of manure and refuse should not be allowed to become breeding grounds for millipedes. Occasional turning of the sides into

Millipedes.
[After *Robinson and Jary.*

the centre of such heaps helps the rotting process and kills much of the vermin and weed seeds present. Debris in dark corners should be raked out and dusted with lime and, occasionally, a handfull of naphthalene flakes should be sprinkled around.

Amongst infested growing plants, place traps and baits of sliced carrots or scooped out potatoes lightly sprinkled with lead arsenate or Paris green. The traps should be sheltered and partly buried in the soil to keep them moist. Examine at least twice a week and destroy any millipedes that have collected.

If planting infested soil, distribute freely in the row a mixture of 1 part of naphthalene with 20 parts of soil, or stir the flakes into the soil directly, at the rate of 1 ounce to 3 square feet of area. Prevention of trouble by sound sanitation is the most satisfactory procedure.

Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hospital	Ballarat	66	Northcote Children's Farm	Bacchus Marsh	156
Ballarat Orphanage	Ballarat	135	Onley, W. H.	"Glenholme," Caldermeade	55
Banyule Stud Pty. Ltd.	Wangaratta	31	Payne, A. E. T.	"Yarra View," Lilydale	63
Black, I. S., Estate	Mount Noorat	53	Payne, T. E. N.	"Woodburn," Kilmore	46
Clarke, A. B.	Glenormiston South	15	Poole, M. A. and D.	Caldermeade	134
Dennis, Mrs. A. A.	Frankston	33	Poole, M. A. and D.	Yannathan	72
Dookie Agricultural College	Dookie	85	Powell, T. S.	"Carellen," Mansfield	46
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Geelong Grammar School	Corio	68	Samuel, Misses G. and E.	Lang Lang	48
Gibson, Mrs. C. S.	"Sweeney's," Eltham	35	School of Horticulture	Burnley	10
Gorman, A. W.	"Cathcart," Alexandra	57	State Experiment Farm	Rutherglen	10
Hollaway, R. W.	Caldermeade	75	State Research Farm	Werribee	229
Kilmany Park Farm Home for Boys	Sale	104	Tanner, N. J.	Pakenham	33
Lawrence, P. H.	"Ralnga," Tarrawarra	72	Vagg, T. E.	Officedale	45
Longerenong Agricultural College	Dooen	43	Wells, W. G.	Caldermeade	63
McNabb and Son, G. A.	Irrewillipe East	154			

In addition to the above-mentioned herds there are 230 commercial dairy herds containing 8,721 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 791 herds in which 15,292 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

"Windrest Chevy's Maiden," Dr. A. R. Haywood's leading junior 3-year-old Jersey, produced 627 lb. butterfat.

"Rose Gem of Maple Lodge" (imp.), another of Captain Payne's Guernseys, produced 763 lb. butterfat. However, as they both failed to recalve within the prescribed period of fifteen months, they forfeited the right to the Reserve Championship. "Windrest Twinkle's Charm," 715 lb. butterfat as a junior four-year-old, has in turn to forego the reserve position for the same reason.

Both the leading Senior four-year-old "Banyule Molly 60th" (605 lb. butterfat) and "Banyule Molly 62nd" (one of the leaders in the Senior three-year-old section, with 558 lb. butterfat) come from a long-tested family, and a long-tested herd. The "Banyule" Jersey Stud was one of the first five herds entered in the Standard Test in 1912, and furnished the first champion cow "Silvermine 4th" with a butterfat yield of 338 lb.

The Jerseys "Windrest Twinkle's Beautiful" (593 lb. butterfat) and "Normandie Hawthorn 15th" (588 lb.), are next in order in the four-year-old section.

"Windrest" Jersey Stud has the two leaders in the junior four-year-old class, namely, "Twinkle's Charm," 715 lb. butterfat (twin sister of "Twinkle's Beautiful"), and "Gay Marie 2nd," 648 lb. butterfat, while in third position is another Jersey, "Belgonia Gem's Noella 4th," with a 639-lb. yield.

In the senior three-year-old section the Guernsey "Yarraview Rougette," 778 lb. butterfat from 17,385 lb. milk with an average test of 4·48 per cent., is easily the highest producer. "Belgonia Buttercup 6th," 565 lb., "Mornmoot Princess Northwood," 548 lb., and "Mornmoot Princess Madeira 14th," 533 lb. butterfat—all Jerseys—are next in order.

"Windrest Chevy's Maiden," 627 lb. butterfat, is top of the junior three-year-old class, with "Coodardy Aldan's Glorious," 618 lb., in second place. The next three places are filled by "Mornmoot" Jersey Stud entries, viz.:—"Princess Madeira 21st," 588 lb., "Golden Cream," 582 lb., and "Mimi 4th," 579 lb. butterfat.

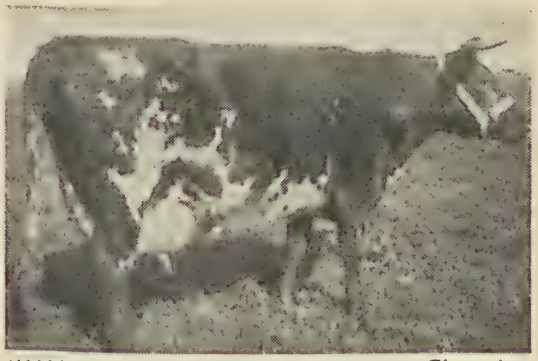
In the senior two-year-old class "The Wattles Myra 10th," 543 lb butterfat leads from "Mornmoot Fancy Starbright 6th," 539 lb., while "Karrara Standard Empire," 531 lb. and her herd mate "Karrara Standard Maid," 502 lb. butterfat are next.

The Champion Herd has the leading junior two-year-old Guernsey, "Yarraview Heiress," 538 lb. butterfat, closely followed by the Jersey, "Maxon Graceful Duchess 5th," 535 lb., while third place goes to "Coodardy Wyandotte," another Jersey, with 503 lb. butterfat.

COWS EXCEEDING 500-LB. BUTTERFAT LEVEL.

Class.	800 to 900 lb.	700 to 800 lb.	600 to 700 lb.	500 to 600 lb.	Total.
Mature	1	1	14	63	79
Senior 4 ..	..	..	1	15	16
Junior 4 ..	..	1	2	9	12
Senior 3 ..	..	1	..	10	11
Junior 3 ..	..	..	2	10	12
Senior 2 ..	..	..	..	4	4
Junior 2 ..	..	..	..	3	3
Total ..	1	3	19	114	137*

* Grand Total.



"Willow Park Duchess 35th," Reserve Champion Cow. This Dairy Shorthorn owned by Mr. W. K. Atkinson, produced 690·5 lb. butterfat.

List of Cows, 600 lb. Butterfat or Over.

Owner.	Name of Cow.	Class.	Breed.	Butterfat.
Walker, C. S.*	Warwick Maggie Woodcrest	Mature	Friesian	817·6
Payne, A. E. T.*	Yarraview Rougette	Senior 3	Guernsey	778·1
Payne, A. E. T.	Rose Gem of Maple Lodge (Imp.)	Mature	,,	762·9
Haywood, Dr. A. R.	Windrest Twinkle's Charm	Junior 4	Jersey	715·1
Atkinson, W. K.*	Willow Park Duchess 35th	Mature	Dairy Shorthorn	690·5
Payne, A. E. T.	Yarraview Teeney	,,	Guernsey	688·1
Devon Park Stud Farm, G. S. Daley	Belgonia Eileen 2nd	,,	Jersey	665·4
Goddard, J. H.	Inverurie Hester	,,	Ayrshire	662·6
Haywood, Dr. A. R.	Windrest Island Goldmine	,,	Jersey	659·2
Estate of the late F. A. Williams	Bamawm Bonnie Lass 2nd	,,	,,	650·4
Haywood, Dr. A. R.	Windrest Rose Marie	,,	,,	649·1
Walker, C. S.	Warwick Polly 10th	,,	,,	648·9
Haywood, Dr. A. R.	Windrest Gay Marie 2nd	Junior 4	,,	648·3
Maloney, P. J.	Belgonia Junette 5th	Mature	,,	647·6
Maloney, P. J.	Belgonia Gem's Noella 4th	Junior 4	,,	638·9
Payne, A. E. T.	Yarraview Ruby	Mature	Guernsey	637·7
Chirnside, R. M.	Mornmoot Princess Madeira 9th	,,	Jersey	631·5
Haywood, Dr. A. R.	Windrest Chevy's Maiden	Junior 3	,,	626·6
Handbury, J. E. and Son	Tooravale Princess 23rd	Mature	,,	621·6
Clark, P. W., and Son	Coodardy Aldan's Glorious	Junior 3	,,	617·8
Devon Park Stud Farm, G. S. Daley	Karrara Fancy Madeira	Mature	,,	612·6
Colenso, L. W. R.	Normandie Ilma 3rd	,,	,,	610·6
Banyule Pty. Ltd.	Banyule Molly 60th	Senior 4	,,	605·1

* Milked thrice daily.

The Six Leading Cows in Each Section.

Owner.	Name of Cow.	Class.	Breed.	Butterfat.
Walker, C. S.	Warwick Maggie Woodcrest	Mature	Friesian	818
Payne, A. E. T.	Rose Gem of Maple Lodge (Imp.)	,,	Guernsey	763
Atkinson, W. K.	Willow Park Duchess 35th	,,	Dairy Shorthorn	691
Payne, A. E. T.	Yarraview Teeney	,,	Guernsey	688
Devon Park Stud Farm, G. S. Daley	Belgonia Eileen 2nd	,,	Jersey	665
Goddard, J. H.	Inverurie Hester	,,	Ayrshire	663
Banyule Pty. Ltd.	Banyule Molly 60th	Senior 4	Jersey	605
Haywood, Dr. A. R.	Windrest Twinkle's Beautiful	,,	,,	593
Colenso, L. W. R.	Normandie Hawthorn 15th	,,	,,	588
Ballarat Orphanage	Orphanage Mirthmaker 9th	,,	,,	570
Lind, A. E., and Sons	Latrobe Statuette 13th	,,	,,	564
Clark, P. W., and Son	Coodardy Centurion's Liberty	,,	,,	547
Haywood, Dr. A. R.	Windrest Twinkle's Charm	Junior 4	Jersey	715
Haywood, Dr. A. R.	Windrest Gay Marie 2nd	,,	,,	648
Maloney, P. J.	Belgonia Gem's Neolla 4th	,,	,,	639
Department of Agriculture	Victoria Rita	,,	Friesian	574
Banyule Pty. Ltd.	Banyule Molly 62nd	,,	Jersey	558
Powell, T. S.	Carellen Lady Starbright	,,	,,	556
Payne, A. E. T.	Yarraview Rougette	Senior 3	Guernsey	778
Maloney, P. J.	Belgonia Buttercup 6th	,,	Jersey	565
Clark, P. W., and Son	Mornmoot Princess Northwood	,,	,,	548
Chirnside, R. M.	Mornmoot Princess Madeira 14th	,,	,,	533
Nancarrow Bros.	Pine Ridge Dream Girl 4th	,,	,,	528
Chirnside, R. M.	Mornmoot Fancy Starbright 4th	,,	,,	527

The Six Leading Cows in Each Section—*continued.*

Owner.	Name of Cow.	Class.	Breed.	Butterfat.
Haywood, Dr. A. R. ..	Windrest Chevy's Maiden	Junior 3 ..	Jersey ..	627
Clark, P. W., and Son ..	Coodardy Aldan's Glorious	,, ..	,, ..	618
Chirnside, R. M.	Mornmoot Princess Madeira 21st ..	,, ..	,, ..	588
Chirnside, R. M.	Mornmoot Golden Cream	,, ..	,, ..	582
Chirnside, R. M.	Mornmoot Mimi 4th	,, ..	,, ..	579
Hodgins, G. E.	Verjean Velveteen	,, ..	,, ..	566
Enders, N. H.	The Wattles Myra 10th	Senior 2 ..	Jersey ..	543
Chirnside, R. M.	Mornmoot Fancy Starbright 6th ..	,, ..	,, ..	539
Devon Park Stud Farm, G. S. Daley	Karrara Standard Empire	,, ..	,, ..	531
Devon Park Stud Farm, G. S. Daley	Karrara Standard Maid	,, ..	,, ..	502
Enders, N. H.	The Wattles Joy 13th	,, ..	,, ..	500
McNabb, G. A., and Son ..	Maxon Handsome Favourite 4th ..	,, ..	,, ..	499
Payne, A. E. T.	Yarraview Heiress	Junior 2 ..	Guernsey ..	538
McNabb, G. A., and Son ..	Maxon Graceful Duchess 5th	,, ..	Jersey ..	535
Clark, P. W. and Son ..	Coodardy Wyandotte	,, ..	,, ..	503
Lyon, W. H.	Avon Blodwin	,, ..	,, ..	486
Maloney, P. J.	Belgonia Eileen 12th	,, ..	,, ..	486
Vaughan Bros.	Lynroy Mona	,, ..	,, ..	484

HERD AVERAGES, 1942-43

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average without Allowances.	Average with Allowances.
		No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.		
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.	lb.
Herds of 25 Cows and Over.																		
1. Haywood, Dr. A. R.	Jersey ..	2	369·9	2	405·9	4	461·1	2	472·6	3	619·3	5	502·8	7	546·7	25	501·6	550·6
2. Maloney, P. J.	,, ..	11	398·0	2	439·1	1	448·2	3	444·0	6	483·8	1	451·2	6	501·1	30	446·6	522·1
3. Hore, E.	,, ..	16	353·2	2	400·8	2	389·8	1	509·7	1	486·8	1	511·4	2	464·0	25	386·7	487·7
4. Bennett, J. W.	,, ..	11	340·8	2	423·3	4	428·4	5	414·0	3	455·6	..	..	13	430·4	38	403·7	474·7
5. Devon Park Stud Farm (G. S. Daley)	,, ..	11	346·7	2	516·7	2	460·5	2	412·3	3	420·9	5	439·2	12	423·4	37	409·0	474·6
6. Read, Estate of the late J. D.	,, ..	7	312·9	3	421·0	4	412·3	1	359·5	6	427·0	3	452·6	12	422·3	36	401·4	462·4
7. Lyon, W. H.	,, ..	13	341·7	4	359·2	2	398·3	2	318·9	5	402·8	4	410·0	10	447·3	40	386·0	461·5
8. Fairchild and Clutterbuck	,, ..	5	305·9	4	389·0	6	395·0	1	339·1	3	390·4	3	413·6	7	409·4	29	381·8	448·1
9. McNabb, G. A. and Son	,, ..	20	287·4	12	336·8	4	368·0	13	341·3	1	455·8	5	374·8	24	375·9	88	336·8	440·5
10. Walker, C. S.	,, ..	6	322·6	5	380·5	9	360·1	2	320·4	3	300·2	2	408·2	14	409·2	41	369·9	437·0
11. Waterhouse, H. W. and Son	,, ..	8	282·0	1	353·1	1	421·9	2	375·4	3	401·8	2	432·3	10	431·5	27	376·5	435·1
12. Ballarat Orphanage	,, ..	5	308·9	4	349·1	1	327·2	2	360·5	2	494·1	1	570·2	18	393·8	33	382·9	431·3
13. Whelpton, B.	,, ..	11	301·8	2	383·9	2	370·2	3	415·9	..	..	1	334·5	6	361·9	25	343·3	423·5
14. Atkinson, W. K.	Dairy Shorthorn	8	309·4	2	368·8	9	319·4	2	308·9	6	296·0	2	349·9	20	404·4	49	352·4	416·0
15. Bennett, R. H.	Jersey ..	4	264·1	1	287·1	1	391·1	5	391·3	1	380·2	1	401·1	12	386·3	25	364·3	410·1
16. Moore, J. and Co.	,, ..	11	287·1	2	336·6	8	329·5	2	425·4	8	386·0	1	461·2	10	316·5	42	334·1	410·0
17. Harvey, T.	,, ..	10	287·4	5	325·9	3	334·7	..	..	8	298·3	..	..	4	366·2	30	312·0	394·8
18. Department of Agriculture	Red Poll	22	289·8	5	297·9	3	296·3	4	320·1	2	239·5	8	330·2	21	329·7	65	308·9	393·3
19. Hurrey, Estate of the late W. H.	Jersey ..	2	291·5	1	323·4	3	285·4	2	369·7	4	324·1	2	419·9	14	377·8	28	354·6	393·2
20. Parker, L. M.	Dairy Shorthorn	3	252·2	3	279·2	1	294·6	3	367·5	2	280·8	2	436·4	11	373·7	25	341·5	388·1
21. Tomasetti, B. G.	Ayrshire	8	242·0	3	267·3	3	339·4	1	263·2	6	320·0	2	328·6	6	371·5	29	304·3	374·8
22. Maher, R. H.	Jersey ..	16	227·8	3	233·4	..	..	3	360·8	5	343·4	5	298·9	11	340·9	43	288·1	364·9

Herd Averages, 1942–43—*continued.*

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average without Allowances.	Average with Allowances.
		No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	lb.	lb.
			lb.		lb.		lb.		lb.		lb.		lb.		lb.			
Herds of 15 to 24 Cows.																		
1. Payne, A. E. T.	Guernsey	4	393·4	2	411·6	1	556·9	2	592·8	..	..	..	..	9	552·0	18	505·9	556·3
2. Chirnside, R. M.	Jersey ..	6	353·4	2	452·6	6	530·7	2	530·2	2	497·5	..	..	6	518·2	24	473·9	545·1
3. Enders, H. H. ..	,, ..	7	373·5	3	471·5	1	434·9	2	508·4	..	..	..	..	3	555·1	16	446·6	530·9
4. Clark, P. W. and Son	,, ..	6	398·9	2	452·9	4	426·8	1	547·7	4	436·9	3	435·0	2	465·6	22	433·5	506·1
5. Colenso, L. W. R.	,, ..	3	333·2	1	400·4	3	379·6	1	378·0	1	459·1	1	588·4	11	500·5	21	451·0	493·0
6. Gay, R. G. and Son	,, ..	2	345·6	2	411·7	3	451·9	1	346·7	1	407·0	..	..	6	498·3	15	440·9	492·9
7. Williams, Estate of the late F. A.	,, ..	6	368·0	2	357·1	..	..	1	362·1	..	..	2	494·5	9	476·4	20	428·1	481·6
8. Powell, T. S. ..	,, ..	4	287·8	6	416·7	2	427·9	3	378·7	1	556·2	1	516·6	5	463·2	22	410·5	481·3
9. O'Neill, J. ..	,, ..	6	343·1	..	..	1	395·8	2	403·5	..	..	..	..	6	439·9	15	393·3	454·7
10. Handbury, J. E. and Son	,, ..	9	298·6	3	361·8	2	379·3	1	348·3	1	503·4	..	..	7	469·6	23	377·0	452·3
11. Vaughan Bros.	,, ..	5	359·0	1	319·6	1	450·4	..	..	3	395·3	..	..	8	427·1	18	398·2	449·7
12. Banyule Pty. Ltd.	,, ..	7	293·5	2	364·2	1	481·6	3	358·6	4	468·3	1	605·1	3	358·9	21	375·9	449·4
13. Clarke, F. W. ..	,, ..	10	323·9	1	393·2	1	425·4	2	410·3	1	369·8	1	382·0	5	416·9	21	367·4	444·7
14. Huffer, J. A. ..	,, ..	7	284·6	6	388·0	2	354·2	1	393·6	1	365·5	1	355·7	5	383·1	23	350·4	429·2
15. Phillips, J. H. ..	,, ..	2	281·9	7	314·1	..	..	2	392·5	2	356·0	2	508·8	5	409·7	20	366·3	427·8
16. Department of Agriculture	Friesians	6	288·8	..	..	2	293·6	1	246·4	3	473·0	..	..	3	421·0	15	350·0	420·5
17. Nicholas, M. A.	Jersey ..	5	298·9	..	..	2	430·8	4	412·9	1	332·0	2	383·9	10	373·4	24	368·4	417·9
18. Wade, W. J. ..	,, ..	3	318·5	3	335·1	..	..	1	377·3	2	457·2	..	..	9	375·5	18	368·4	414·4
19. Smith, R. W. and Son	Friesian..	10	279·9	2	341·0	2	322·5	1	422·4	..	..	4	370·9	5	406·3	21	336·0	411·3
20. Cowan, G. L. S.	,, ..	2	256·2	4	305·6	1	362·8	2	397·3	1	394·5	..	..	8	396·9	18	359·0	409·4
21. Butcher, F. T.	Red Poll	5	267·0	2	276·1	1	369·6	2	359·4	1	393·9	..	..	6	408·1	17	342·3	404·4
22. Broad, Mrs. A. A.	Jersey ..	7	279·3	2	311·3	2	430·6	2	326·3	5	337·6	1	350·3	2	377·5	21	327·8	404·2
23. Desmond, J. J.	,, ..	5	212·9	..	..	2	371·7	3	345·8	1	485·0	..	..	7	391·5	18	337·3	393·2
24. Tyssen, C. J. ..	,, ..	4	285·6	1	448·1	..	..	2	362·7	..	..	1	337·2	10	365·9	18	350·6	392·1
25. Hore, M. T. ..	Friesian..	5	250·8	1	235·2	1	279·0	1	322·9	2	315·0	1	438·6	5	415·1	16	327·2	386·4
26. Macauley, C. W.	Jersey ..	7	307·8	1	238·4	2	331·5	..	..	2	280·8	1	373·3	6	346·2	19	319·4	384·5
27. Ross, D. M. ..	Dairy Shorthorn	5	281·0	6	263·7	4	292·3	..	..	1	349·6	..	..	..	..	16	281·6	379·6
28. Meaklim Bros. ..	,, ..	3	313·8	2	253·9	5	314·9	2	263·7	1	388·3	2	311·7	6	360·5	21	320·3	378·5
29. Unthank, Miss F.	Jersey ..	7	287·1	..	..	..	..	..	..	2	293·2	1	299·6	6	357·4	16	315·0	374·2
30. St. Joseph's Home	,, ..	7	289·5	2	289·6	2	255·7	2	303·9	..	..	..	..	2	253·7	15	282·1	370·1
31. Bott, J. ..	Red Poll	1	262·3	4	272·7	1	194·8	2	275·4	3	342·1	4	341·8	9	341·2	24	315·1	358·0
Herds of 10 to 14 Cows.																		
1. Mitchell, R. H.	Jersey ..	2	418·4	2	452·7	3	433·3	2	410·8	..	..	..	..	4	487·6	13	447·2	508·7
2. Ronalds, O. ..	,, ..	3	379·8	2	404·6	1	436·4	1	468·8	..	..	..	..	3	466·7	10	425·4	495·4
3. Jackson, H. ..	,, ..	4	354·7	1	390·9	..	..	..	..	..	..	..	..	5	509·4	10	435·6	493·6
4. Masters, S. H. and Son	,, ..	5	377·8	..	..	2	405·3	1	476·9	..	..	..	..	5	464·8	13	423·1	486·2
5. Dennis, Mrs. A. A.	,, ..	5	355·9	..	..	2	371·2	1	521·8	3	429·3	..	..	1	395·1	12	393·9	472·2
6. Hodgins, G. E.	,, ..	3	308·4	4	291·2	6	453·8	..	..	1	428·8	..	..	..	..	14	374·4	465·8
7. Keele, H. A. ..	,, ..	4	317·8	3	340·7	..	..	2	418·0	2	445·8	..	..	2	433·3	13	375·9	451·3
8. Nancarrow Bros.	,, ..	1	334·8	1	367·9	1	407·7	2	468·9	1	247·9	2	426·6	3	375·3	11	388·6	434·1
9. Stirling, H. V.	,, ..	5	300·4	1	448·6	2	302·8	1	496·7	..	..	..	..	2	348·0	11	340·8	424·4
10. Hardie, R. B. ..	,, ..	4	303·1	2	344·8	..	..	..	..	1	482·4	1	353·4	3	363·6	11	348·0	415·3
11. Trevaskis, F. T.	,, ..	..	..	4	371·8	1	284·8	..	..	..	..	2	359·9	6	396·6	13	374·7	414·7
12. Langlands, F. B.	,, ..	4	299·1	..	..	1	458·8	1	385·9	1	370·0	..	..	3	352·9	10	347·0	413·0
13. Chadderton, J. E.	,, ..	3	255·8	..	..	1	327·1	..	..	3	371·4	..	..	5	388·2	12	345·8	392·5
14. Hicks, E. J. ..	,, ..	3	273·1	1	229·9	3	341·9	2	296·3	..	..	1	407·9	3	380·6	13	324·4	389 0
15. Stephens, Dr. F. G.	Guernsey	2	208·5	2	303·4	1	496·2	1	298·2	2	324·7	2	253·8	3	402·0	13	321·6	375·5
16. Coulthard, J. J.	Jersey ..	7	253·8	1	287·7	3	299·8	..	..	..	..	..	..	3	361·5	14	289·2	373·5
17. Broad, A. J. ..	,, ..	2	257·1	2	333·2	..	..	3	321·5	..	..	2	337·8	4	288·2	13	306·1	356·9

The Standard Herd Test records for the quarter ended 30th June, 1943, will be included in the Standard Herd Test booklet to be published towards the end of September. Copies of this booklet may be obtained, after 1st October, from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

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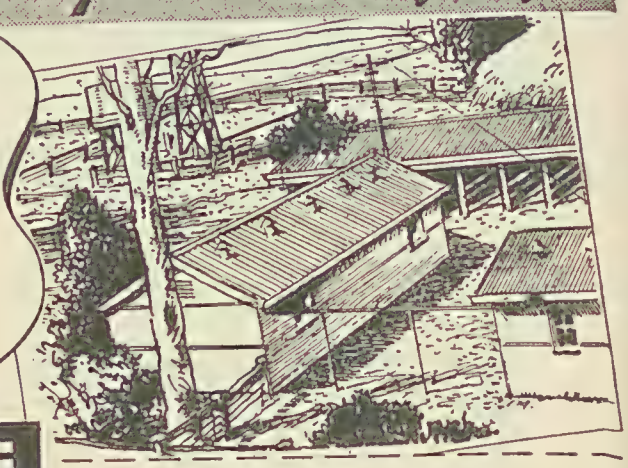

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The Development of Mallee Pastures

Investigations at the Mallee Research Station, Walpeup

By C. G. WEBB, M.Agr.Sc., Science Field Officer

Foreword by L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

Pasture improvement has progressed rapidly in Victoria during the last twenty years, and may be measured by the increasing live stock population and extra production, which more than offset the exploitation characteristic of earlier years and which is continuing in many parts.

Improvement of pastures in Victoria depends primarily upon the introduction of cultivated species from Europe, and naturally it has been most marked in the higher rainfall areas of the State.

With a growing appreciation of the need for fertility conservation, farmers are turning their minds to pastures as soil stabilizing and fertility regenerating agents, but workers in the field of pasture improvement in the Mallee are severely restricted by the low rainfall and the vagaries of the seasons.

There is a very limited choice of pasture species adapted to such conditions, but the most promising of those available are being tried under field conditions at the Mallee Research Station, and Mr. C. G. Webb's observations, recorded in the following article, make an interesting contribution to the study of the problem of pasture improvement in the Victorian Mallee.

THE wartime demand for higher meat production has emphasized the need for a series of pasture plants to provide grazing in the Mallee throughout the year. Such a necessity, however, was evident long before the war began. It has been felt for a considerable period that a diversification of farming practices, and the lengthening of the period between successive crops to be harvested from a particular area, will greatly assist in maintaining soil fertility, and in combating the wind erosion problem. There is definite evidence that cropping rotations are becoming longer in the Mallee, and in order to provide the best economic use of the land out of cultivation it is considered to be necessary to provide a series of pasture plants whose combined optimum periods of growth will provide grazing throughout the year.

The carrying capacity of the normal Mallee pasture is low, and if the best use of the land is to be obtained it will be necessary to encourage natural species and introduce others suitable to the Mallee environment. Such a task is made more difficult in an area of low and unreliable rainfall subject to sand storms which often do physical damage to young pasture plants. It is unfortunate that there are few similar areas in other parts of the world from which suitable introductions can be made. After a study of a number of species from many countries it has been possible to test several of the most promising of them under field conditions at the Mallee Research Station, Walpeup. These have included Crested Wheat Grass (*Agropyrum cristatum*), Perennial Veldt Grass (*Ehrharta calycina*), Toowoomba Canary Grass (*Phalaris tuberosa*), Bulbous Blue Grass (*Poa bulbosa*), Evening Primrose (*Oenothera odorata*), Wimmera Rye Grass (*Lolium subulatum*), Blue lupins, Subterranean Clover (*Trifolium subterraneum*), Strawberry Clover—Palestine Strain—(*T. fragiferum*), and the following medics—Lucerne (*Medicago sativa*), Barrel medic (*M. tribuloides*), Confinis Clover (*M. confinis*), and Snail Clover (*M. scutellata*). There are several other species which also have been tested under field conditions, but they have not shown as much promise as those already mentioned.

In some parts of the State it is possible to sow the area with a mixture of species whose carrying capacity is determined by the extent to which production during its least period of growth can be supplemented by fodder conserved from the pasture during its maximum

Evening Primrose, a hardy plant under dry conditions.

period of growth, i.e., in the spring. Experience in the Mallee has shown it to be more desirable to spread pasture and fodder production through the year with a series of species whose optimum periods of growth occur at different periods of the year. In such an area of unreliable rainfall it is imperative to conserve sufficient fodder in order to provide for periods of low production which may occur at almost any time of the year. If such a precaution is not taken, and the available feed is not sufficient to maintain the stock on hand, conditions are set up which not only destroy the established pasture, but also pave the way for increased erosion.

Species whose combined performances have shown most promise of providing grazing throughout the year in the Mallee are as follow:—

Cereals sown for grazing —in the autumn and which provide feed during the winter and spring months.

Wimmera Rye Grass and Barrel medic — preferably sown as a mixture—whose optimum period of growth is during the spring and may be prolonged by late although unreliable rains.

Lucerne.—When satisfactory establishment has been obtained, lucerne has proved itself to be a valuable drought resistant perennial legume and, although not entirely dormant during the winter months, provides most growth during the period between late spring and early autumn, if suitable rains are received.

To these species may be added cereal stubbles which provide valuable dry feed during the summer months. If the wheat area continues to decline, the amount of this stubble grazing will be lower, but there are signs that this reduction will be more than offset by a system where cereals, after being grazed during the winter months, will be allowed to

Successful establishment of lucerne on Mallee limestone country near Antwerp.

Lucerne established at Walpeup under cover of a wheat crop.

mature and be grazed in the head during the summer.

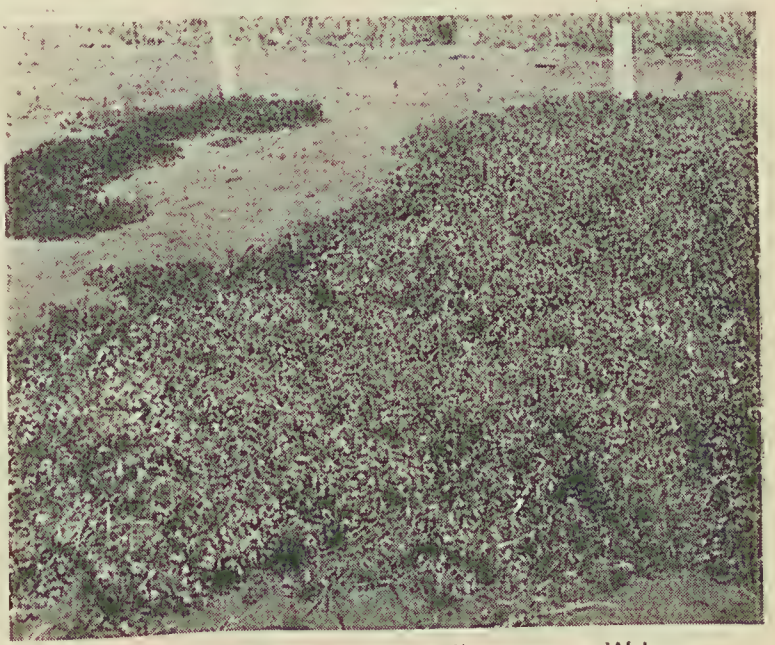
The species abovementioned have the advantage of being readily available on the market at reasonable prices. Such a consideration is important in view of the fact that the land on which they are to be grown is of low value and comparatively low potential carrying capacity.

As the performances of lucerne and cereals for grazing in the Mallee have been described in previous issues of this *Journal* it is not considered necessary to deal with them in detail, in this article. These species are regarded as very important in the Mallee grazing programme and every effort is being made to discover the best conditions for their growth.

Wimmera rye grass is a common species in many parts of Victoria, and is regarded as a weed in parts of the wheat belt. It has shown an ability to become naturalized in the Mallee and is, therefore, regarded as a valuable introduction. It has also shown a tendency to become acclimatized rapidly, and it is hoped to produce a strain particularly suitable to Mallee conditions. Several strains of different maturity have been tested at Walpeup, where it is hoped to build up a supply of the most desirable strain. This grass has been sown in field trials at Walpeup and has made good establishment and growth under hard conditions. It has produced an attractive sward when sown as a mixture with Barrel medic. Five acres of this mixture, in addition to providing feed at other periods of the year, supported 82 young crossbred ewes for 26 days in September, 1942.

Barrel medic is one of a genus which has shown particular promise under Mallee conditions. It was first tested at Walpeup in 1938 and, as a result of its growth during that drought year, was promoted to field trials in 1939. It has been under observation in the drier areas of South Australia for some years and has proved itself to be a valuable annual legume under such conditions.

Although the South Australian strain has been successful at Walpeup, there are several Victorian strains which are under observation and may possibly prove to be more valuable under local conditions than the South Australian strain. The field of medics is being



Specimen plants of Barrel "clover," growing at Walpeup.

South African Veldt grass shows promise under dry conditions in this State.

further explored for species which would provide satisfactory growth under Walpeup conditions. Small Hairy Burr Medic (*M. minima*) has appeared naturally in many parts of the Mallee and, for this reason, is regarded as being worthy of encouragement. It has shown a good response to superphosphate, but does not produce as much fodder as Barrel Medic. Snail clover is another medic which has produced an excellent amount of fodder, but its reactions to grazing have yet to be determined.

The combined period of growth of the above species is from the beginning of July, when cereals are usually available for grazing, to the end of March, when the optimum period of lucerne growth usually has passed. The beginning and end of this period are under the control of the very unreliable seasons and may vary accordingly. It is seen, however, that the period from April to June is usually a critical one, unless early feed is produced by particularly good autumn rains. If these are satisfactory, good feed comes away as self-sown in stubbles. Naturally-occurring grasses such as Barley Grass (*Hordeum murinum*) and Arabian Grass (*Schismus barbatus*), give satisfactory feed under such conditions, but it is most necessary to have fodder reserves in order to provide for a failure of such rains, particularly as most Mallee lambs are dropped during this period. Oats, as hay or grain, have been used for this purpose in the past and it is considered that more efficient use could be made of them in the future. Being commodities with a market value, their use is controlled by the comparison of their value with that of the sheep which they have to maintain. Silage is a succulent fodder the use of which at present is very limited in the Mallee, but it is considered to have great possibilities in providing, in conjunction with oaten grain, a succulent supplement during the vital lambing period. It is considered that its limited use at present is mainly due to the fact that farmers have had little experience with it and are slow to appreciate its value.

The major part to be played by Mallee pastures in the future will probably be directed by world conditions, but a very definite local need for their use will always be present in the necessity for providing the most economic use for the increasing area of land out of cultivation. It is encouraging to know that there is a series of species whose combined periods of growth will provide pasture throughout the major portion of the year, and every effort will be made to increase the efficiency of these species, which may be replaced by more suitable species in the future. The necessity for the conservation of sufficient fodder reserves will, however, always be a major consideration in the Mallee grazing programme.

—— SUPPORT THE FOURTH LIBERTY LOAN ——

THE SOYA BEAN

By ALAN R. RAW, M.Agr.Sc.,
Cereal Geneticist

THE successful exploitation of the soya bean, both agriculturally and industrially, in the United States of America has aroused considerable interest, and suggests the possibility of establishing the plant as a commercial crop under local conditions.

The bean is an annual summer growing legume which reaches a height of several feet under good conditions. The plant is bushy in character, the stems being woody and branched, with the leaves and pods borne in clusters. The pods are small, and contain from two to four seeds which vary in colour with the variety. The bean is a native of south-eastern Asia, where it is recognized as the most important legume crop, serving as a source of food for man and beast.

Soya beans growing at Myrtleford.

The soya bean is remarkable for the wide variety of uses to which the plant and its seed can be put. The plant is particularly nutritious and furnishes an excellent food for live stock both in the green and dry state. The crop may be grown, for green feed, hay, silage, grain, or as a green vegetable for human consumption. Its value for grazing is limited by the fact that only one feeding is possible as the plant does not recover. For this reason it is doubtful whether, under local conditions, it could compete with established summer fodders such as cow peas.

The dried bean, which is rich in protein and oil, is suitable for canning, and for the preparation of diabetic and other human foods, but finds its greatest use in industry, where it is regarded as a valuable source of oil. The oil is used in the manufacture of foods, paints, rubber substitutes, and so on, while the residue is utilized for human and stock foods and for the manufacture of plastics, glues, and water paints.

Climatic Requirements

The soya bean is essentially a crop of the temperate regions where relatively warm, moist summer conditions prevail. The plant is very susceptible to frost in all stages of growth and can be cultivated only in those districts which enjoy a frost-free period of from four to six months. The crop requires an annual rainfall of at least 20 inches, the greater portion of which is spread over the growing period from October–March. In view of this, successful production in Victoria will be limited to the more favoured districts, and to irrigation areas. Though classed as drought resistant, the bean will not stand up to the conditions prevailing in the wheat areas of the State. Excessive heat, particularly at flowering, when it inhibits pod formation, and at maturity when it causes the pods to burst and shed their seed, is detrimental to the full development of the plant. Generally speaking, the bean is adapted to those areas in which maize and other summer crops can be successfully grown. It is probable, however, that the area of successful cultivation could be extended considerably by the use of suitable varieties.

Because of its sharply defined climatic requirements, suitable areas for the production of soya beans in Victoria are limited. The fertile river valleys of Eastern Gippsland and the North-East offer the greatest chance of success, but in these areas the bean would come into competition with well-established summer crops. It is likely that

A heavy-yielding plant showing no root nodule development.

successful crops could be produced in Southern Gippsland, portions of the Western District, and in the irrigation areas.

Soils

Soya beans are adaptable to a wide range of soils but show a marked preference for rich friable sandy loams. Any reasonably fertile soil is suitable, providing it is well drained, and good results have been recorded from pure sands and from heavy clay loams. Stiff heavy soils are not desirable as they are difficult to work and have a tendency to set, causing trouble at germination.

Varieties

The question of varieties is of supreme importance in soya bean cultivation. The plant is extremely sensitive to environmental changes and because of this, varieties are strictly localized in their adaptability. Before the crop was successfully established in U.S.A. it was necessary to import and test more than 10,000 distinct strains in order to obtain types suited to the local conditions.

Varieties differ widely in their period of maturity, in the nature of their growth, and in the shape and size of their seed. As a rule the later maturing varieties produce a much greater amount of growth than do the early ones, and are therefore more useful for hay or forage purposes. On the other hand, many of the early types are excellent seed producers and their relatively short growing period enables them to be cultivated successfully over a wider range of conditions. In regard to the varietal question, the local grower is unfortunate in that seed supplies are limited to a very inadequate range of varieties. The most easily available sort is the standard American variety Mammoth Yellow. This variety which takes from four to five months to mature, produces large yellow seeds of high oil content. It has given quite satisfactory crops in the maize areas of this state.

Cultivation

Thorough preparation of the soil is essential for successful soya bean production. Cultural operations should aim at the development of a firm moist seed-bed overlain by a fine surface mulch from two to three inches deep, and at the eradication of weed growth. A well-prepared seed-bed insures an even depth of planting and a good germination.

Since the crop will not be sown before October, early spring plowing, followed by intensive cultivation to destroy successive crops of weeds, should prove satisfactory in the higher rainfall areas, particularly in those in which maize is a standard crop. On the poorer lands however, and more especially on those in the lower rainfall limits, autumn or early winter plowing is to be recommended. This will permit a short fallow during which moisture may be conserved for use by the crop in the spring and summer months.

Soil treatment subsequent to plowing will vary to a great extent with soil and seasonal conditions. In this regard, much depends upon the discretion of the individual farmer as to the type of implement to use and the most advantageous time to use it. Generally speaking, when spring plowing is practised on friable soils, two thorough cultivations, preferably with a disc implement, will be required. These must be supplemented by the judicious use of harrows to control weed growth and to develop a surface mulch. When the land has been autumn plowed, on the tighter soils, at least one extra cultivation will be necessary, the final one being given just prior to seeding. It is essential to keep the land free from clods, and in order to achieve this the use of the roller must be resorted to. Too much stress cannot be laid on the importance of the harrows as a cheap and effective means of weed control, and in maintaining surface texture both before and after seeding.

Seeding Operations

Seeding must be delayed until all danger of frost is past. There should be sufficient moisture in the ground to insure a rapid germination. The land should be harrowed just prior to the commencement of seeding operations. The seed is usually sown in rows spaced 36 inches apart. Narrower spacings are sometimes employed, particularly if the crop is to be used for forage or hay purposes, but it is generally conceded that the wider spacings, which allow for efficient inter-row cultivation, are the most satisfactory.

Small areas may be sown by hand, or with any implement of the Planet Junior type. For larger areas, an ordinary seed and fertilizer drill, or any type of maize planter may be used. With the ordinary seed drill a 35-inch spacing can be achieved by using every fifth hoe for sowing. The remainder may be effectively blocked by pressing a small piece of bag firmly into the cups. Thus, in a fifteen-hoe drill, the desired spacing would be achieved by blocking all hoes except the third, eighth, and thirteenth, and allowing a normal overlap between strikes of the drill when sowing, i.e., wheel on last hoe mark. The set-up will of course vary with the size of the drill employed, but a little thought will enable the farmer to adapt his machine to the purposes. The seed will be sown through the oat runs of the machine, after the correct gear-setting has been determined by experiment. Where the maize planter is employed for seeding little adjustment will be necessary.

The seed is sown 1½ to 3 inches deep according to the nature of the soil, at a rate of 30 to 40 lb. per acre; this will allow of a spacing of from 6 to 8 plants per foot of drill row. The seed should be not more than twelve months' old, as the beans rapidly decrease in viability in storage.

Manuring

The soya bean responds to dressings of superphosphate, and applications of up to 2 cwt. per acre of this manure are to be recommended. For best results the manure should not be allowed to come into direct contact with the seed as it may adversely affect germination. In cases where an ordinary seed and fertilizer drill is used, the machine can be adapted to deliver the manure through the hoes on either side of the grain feed. These can be directed in towards seed hoe so as to place the manure a few inches away from the seed. A similar result may be achieved with a maize planter, fitted with a fertilizer attachment. Where the machine is not suitable for adaptation the manure should be broadcast or drilled in prior to seeding. Nitrogenous fertilizers for soya beans are usually not to be recommended, since the plant belongs to the legume family the members of which are capable of obtaining their supplies of nitrogen from the air. This they do through the medium of colonies of microscopic organisms—bacteria—which live on the roots of the plants. For maximum results it is necessary to introduce these organisms into the soil by the inoculation of the seed with pure cultures. Unfortunately, these cultures are not available on a commercial scale in Victoria at the present time, but the Biological Branch of the Department of Agriculture can supply cultures for use on an experimental scale. It has been demonstrated however, that satisfactory crops can be produced without inoculation, provided the supply of available nitrogen in the soil is naturally high, or that it can be supplemented by dressings of nitrogenous fertilizers. Under these conditions the use of sulphate of ammonia, or of superphosphate—sulphate of ammonia mixtures might be profitable under local conditions.

Soya beans showing pods borne right to the end of the runner.

Development of root nodules on soya bean plant following inoculation of the seed.

Post Seeding Cultivation

The land should be harrowed immediately after seeding to leave the surface of the soil in a loose condition. During the period between sowing and complete germination a close watch should be kept in the paddock for signs of surface crusting. Should these appear a second harrowing must be given to assist the emergence of the young plants. Post seeding cultivation will aim principally at weed control. If weed seeds germinate with the beans, the crop should be given a further harrowing making the strokes diagonal to the rows. Provided that the harrows are light, the ground is not cloddy, and that care is taken to work under warm, dry conditions little damage will be done to the crop even when the plants are five or six inches high.

Subsequent cultivation will be determined by local conditions. Under normal circumstances only two inter-row cultivations will be necessary, the first being given three to four weeks after sowing, the second, just prior to flowering. Any suitable implement such as a maize cultivator or a rotary hoe may be employed for this purpose. Cultivation should be three or four inches deep at the centre but fairly shallow near the plants, which should be approached as closely as possible to reduce the amount of hand hoeing and weeding necessary. It should leave the land in a level condition to facilitate harvesting. All cultivation should be discontinued before the crop is in flower.

If the crop is to be irrigated, the furrow system should be adopted. Soya beans are particularly susceptible to excess water and promiscuous flooding of the land is to be avoided at all costs. Irrigations should be quick and light and should be given as required. Unless obviously necessary, the final watering should be given just prior to the flowering of the crop. Cultivation after each irrigation is desirable to control weed growth.

Harvesting

When grown for hay purposes, the crop should be harvested when the seeds are half developed, i.e., some three or four weeks before the crop is fully ripe. At this stage the plant still retains its leaves and the stems are not harsh and woody. The crop is normally cut for hay with the ordinary mower. It is left in the swathe for a day or two until well wilted and is then cocked in small heaps until sufficiently dry for carting and stacking. For grain, the crop is left until the beans are in the hard dough stage. As this stage is approached, the leaves turn yellow and fall, leaving the bare stems with their clusters of seed pods. In hot weather, or if the crop is left standing too long, the pods will burst and shed their seed. Harvesting may be done with a binder in which case the sheaves should be loosely tied and cured in small stooks, or they may be harvested with a mower, fitted with a side delivery attachment. A small cultivator or scuffler adapted for skimming out field beans may be used. On small areas, hand pulling may be resorted to. The crop may be threshed on any ordinary threshing machine, using a pea concave, and reducing the speed of the drum. Care must be taken not to damage the seed as this reduces the market value.

The use of a light horse-roller for threshing the crop is also quite satisfactory. The plants are spread on a hessian sheet in a layer about two feet deep and are then rolled. The stems are forked off and the beans collected by hand and winnowed. Hand flailing is satisfactory for small crops.

Care should be taken to see that the beans are thoroughly dry before bagging, otherwise they are liable to heat in the stack. Should this occur, the bags must be emptied and the beans spread out in a thin layer to dry.

Generally speaking, soya beans are not subject to the attacks of serious diseases. They are however very palatable to rabbits and care should be taken to protect the crop from these pests.

Standard Herd Test

A New Butterfat Record

By D. R. McKENZIE, Senior Dairy Supervisor

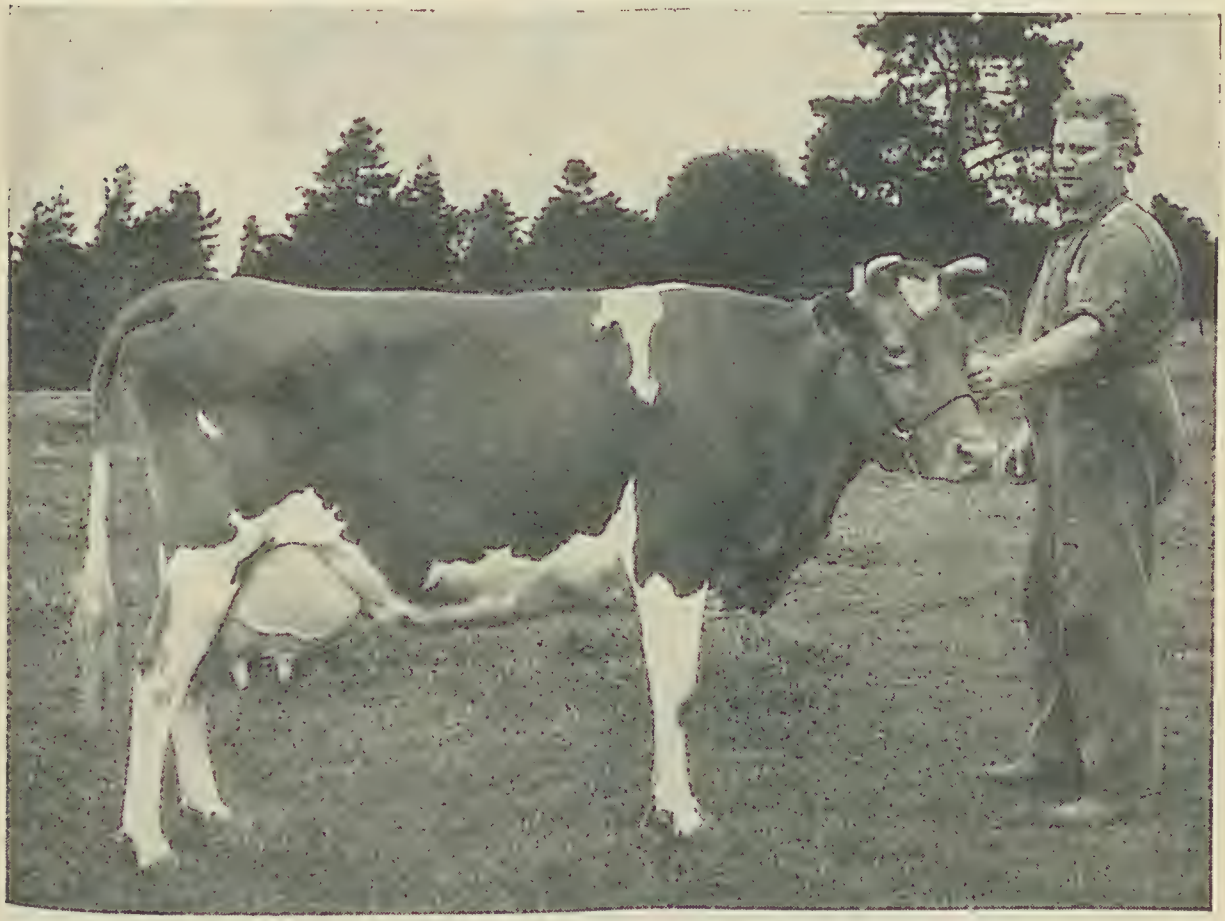
CAPTAIN A. E. T. Payne's Guernsey cow, "Yarraview le Mode," recently completed her 273 days lactation and has exceeded by 41 lb. the 935 lb. butterfat record of the Jersey cow, "Banyule Tiddlewinks 26th," established in the previous year's Test.

"Le Mode" produced 15,000 lb. milk with an average test of 6.50 per cent., equivalent to 975.8 lb. butterfat. She was milked thrice daily for three months during her lactation. The merit of the performance is enhanced by the fact that she is due to recalve within twelve months from the commencement of this phenomenal yield.

"Le Mode" now has three Australian butterfat records for the Guernsey breed, viz.—Mature, 976 lb.; junior four-year-old, 738 lb.; and junior two-year-old 563 lb. In 1941-42 she was the Standard Herd Test Reserve Champion as a mature cow with 816 lb. butterfat, and now has the splendid average of 773 lb. butterfat in four lactations.

The world's record for the Guernsey breed is claimed for an American cow, "Anesthesia Faith of Hill Stead," with a butterfat yield of 1,112.5 lb. in 365 days.

Like many of our high producers, "Le Mode" is line-bred. Her dam is a granddaughter of



Mr. J. Dawson, Capt. Payne's herd manager, with "Yarraview le Mode."

PEDIGREE OF "YARRAVIEW LE MODE."

Yarraview Le Mode.

Sire : Camilla's Majestic 3rd of Maple Lodge.
- Benefactor of Maple Lodge.
  - Sunrise of Maple Lodge.
  - Clara's Pansy of Maple Lodge.
- Camilla of Maple Lodge.
  - Slogen of Kings Mills.
  - Valentine of Maple Lodge.

Dam : Clara's Fashion 8th.
- Camilla's Majestic 2nd of Maple Lodge.
  - Sunrise of Maple Lodge.
  - Camilla of Maple Lodge.
- Clara's Fashion.
  - Sequel's Lodestar.
  - Clara of Maple Lodge.

"Sunrise of Maple Lodge" and "Camilla of Maple Lodge" while her sire is a son of "Camilla of Maple Lodge" and a grandson of "Sunrise of Maple Lodge."

Unfortunately little is known of "Le Mode's" sire except that he is a half-brother of "Camilla's Majestic of Maple Lodge" the sire of many of the high producers in the "Yarraview" herd.

"Le Mode's" dam, "Clara's Fashion 8th" produced 414 lb. butterfat as a junior two-year-old; 427 lb. as a senior three-year-old; and 492 lb. as a senior four-year-old.

"Yarraview Benefactoress" by "Honoria's Benefactor" (imp.), another daughter of "Clara's Fashion 8th," has the highest Australian butterfat production (656 lb.) for the breed as a senior three-year-old; she previously produced 521 lb. butterfat as a junior two-year-old and 632 lb. as a senior two-year-old.

There are many other splendid producers in the "Yarraview" herd, which has placed Captain Payne among the leading Guernsey breeders in Australia.

THE MONTHLY PRODUCTION OF "LE MODE."

Month.	Milk.	Test.	Butterfat
	lb.	%	lb.
1942—			
December ..	1,905	6·48	123·4
1943—			
January ..	2,145	6·63	142·2*
February ..	1,890	6·24	117·9*
March	1,815	5·81	106·0*
April	1,665	6·27	104·4
May	1,485	6·61	98·2
June	1,485	6·83	101·4
July	1,455	6·45	93.8
August ..	1,155	7·66	88·5
Totals ..	15,000	6·50	975·8

* Milked thrice daily.

Oversea Parcels of Produce

Parcels of foodstuffs to relatives and friends in the United Kingdom may be sent through the Department of Agriculture. The Department has arranged for despatch, through the post, of a small parcel of 5 lb. gross weight, conforming to the conditions laid down by the British authorities.

The parcel will contain a 16-oz. packet of raisins, a 12-oz. tin of full-cream powdered milk, a 12-oz. tin of lambs' tongues, one 12-oz. tin of marmalade, and one 4-oz. packet of mixed candied peel.

The cost of the parcel, including packing, postage, &c., will be nine shillings and sixpence (9s. 6d.) for delivery to civilians, and seven shillings (7s.) for delivery to members of the oversea forces in the United Kingdom, provided the full service address can be given.

Orders will be accepted, until further notice, for despatch at donors' own risk to any address in England, Wales, Scotland, and Northern Ireland, and should be forwarded, together with the necessary remittance, to the Director of Agriculture, Public Offices, Melbourne, C.2.

Orders for parcels to residents in Eire (Irish Free State) cannot be accepted because of the heavy customs duty in that country.

The British authorities will not permit the receipt of parcels at frequent intervals, and only one order will be accepted at the one time for each recipient.

Some Aspects of . . . . Swine Husbandry

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

THE farmers of Australia are being asked to produce more foods now than ever before. Their goals include vast quantities of meats, milk, milk products, and eggs. To help achieve these goals everything possible must be done to protect and maintain the health of our live stock, and to improve the productive capacity of all stock, particularly breeding stock, so that animals slaughtered for food may be readily replaced. This will involve not only preventive and control measures, but also active curative treatments against all animal disease and parasites. Preventive measures will include the practice of high standards of hygiene and sanitation.

Changes in feeding principles will be necessary because of the shortages of some feeds, involving the use of substitutes. Great care and attention therefore must be given to the feeding of live stock if best results from available foodstuffs are to be obtained.

The abovementioned factors apply equally to all classes of live stock, but it is the purpose of this article to discuss, more particularly some of the practical means whereby the production of pig meats may be increased.

Factors which will have a predominant influence towards this end are improved breeding, feeding, and management.

Improved Breeding—demands the mating of strong, healthy and prolific breeding stock of correct type. If possible, only those sows which have proved their ability to reproduce satisfactorily should be selected, and boars should have a proved breeding record. As a rule, older breeding stock are more prolific and reproduce stronger offspring and older sows usually produce more milk and take better care of the piglets than do young animals.

The use of breeding stock of poor type, size, and stamina is to be avoided.

Care must be taken in the selection of young replacement breeding stock. Where possible, this selection should be made from the home farm herd as a precaution against the introduction of infectious diseases. In addition, in all cases, introduced pigs should be isolated from the home animals for three to four weeks.

Improved Feeding—The importance of laying a sound foundation of health in the early weeks of the pig's life and the influence of correct

feeding and management in the period following weaning cannot be too strongly stressed. Nor can it be over-stressed that the nutrition of the pig begins with the feeding of the sow.

Over-feeding may cause the sows to become too fat while under-feeding is equally bad. Both conditions may result in the farrowing of weak, unthrifty piglets.

The ration of the sow must include a sufficient quantity of protein, some of which should be of animal origin, i.e., meat scraps or meat meal, milk or milk products. Pasture, because of its vitamin content, is important for pregnant sows and, in the absence of a pasture paddock, good quality lucerne hay should be provided.

Sows should be individually penned for farrowing and greater care must then be taken with their diet, particularly to avoid constipation.

The use of guard rails in the farrowing pens to prevent injury to the newly born pigs is advisable.

After farrowing, the sow must be fed for milk production to ensure strong thrifty pigs. When the litter is two weeks old, the sow should be getting all the food she can consume and food should also be provided for the litter in a low trough or self-feeder in a creep away from the sow. If a self-feeder is being used, water or milk also must be available to the young pigs. This practice of providing supplementary feed to the young pigs right through the suckling period increases their growth rate and prevents any check at weaning time.

Improved Management—Poor management results in the deaths of thousands of pigs annually, thus nullifying the benefits obtained from good breeding and good feeding. Good management involves many factors of which the following are important.

Sanitation and Housing—Contrary to some opinions, the pig thrives best when its quarters and surroundings are clean, dry, and comfortable.

Drainage must be good so that infectious, filthy material does not accumulate. To this end wallows and mud holes should be drained and filled. Feeders must be cleaned regularly and thoroughly. Water supply should be ample and of good quality.

Sunlight should have free access to all sties, &c., which should be warm, dry, well ventilated, and free from draughts. Pasture runs are a definite asset and should be used in rotation so that young pigs can be placed on soil free of parasites. Ample shade also should be provided.

Disease control in pigs can be practised by attention to the following details:—Prevention of over-crowding and over-feeding, avoidance of constipation or scouring; regularity in feeding with variety in the diet, and provision of roughage or greenfeed where necessary; sanitation, drainage, and hygiene; prevention of checks to young growing pigs particularly at weaning, and the prevention of extremes in temperature by shade in the summer and the provision of ventilated, but draught-proof housing, adequate for the number of pigs kept.

In addition, careful observation and the immediate isolation and treatment of any sick pig in the early stage will help to prevent the spread of infection. Further, the isolation of recent purchases until it is clear they are not disease carriers should become a routine practice.

External parasitic conditions, i.e., lice, mange, &c., can be checked by oiling or spraying or by the provision of "rubbing posts" partly covered with oiled bagging, against which the pigs can rub themselves.

Control of internal parasitic infestations in pigs becomes at times difficult. In this respect, the system known as the McLean County System for ascaris control offers a line of procedure both practical and profitable. Briefly it consists in the thorough cleansing and disinfection of the farrowing pen, the cleansing internally and externally of the sow, and the protection of the sow and litter from infection until they can be placed on clean pasture.

It must be further emphasized that proper sanitation is most important not only in the rearing and raising of pigs, but also in the control of most of the specific and infectious diseases which are the cause of pig mortalities

MAKE HAY WHILE THE SUN SHINES

CONSERVE FODDER FOR THE WINTER

INTERNAL PARASITES OF SWINE

By J. W. EVANS, B.V.Sc.,
Veterinary Officer

Healthy pigs reared under hygienic conditions.

ALTHOUGH, by reason of its climatic conditions, Victoria is more favorably placed with regard to some internal parasites of swine than are more northern parts of Australia, nevertheless extensive losses do occur each year.

In general, adult pigs are but little affected. In the young animal however, internal parasites may cause serious ill-effects. By imposing a continuous drain on its vitality and gradually sapping its strength, worms so undermine the health of a young pig that it never fully recovers and, being incapable of normal growth, makes no profitable return to the farmer.

Thrifty growth in pigs is of the utmost importance to the pig-raiser; it is an index of profit. The economic losses attributable to internal parasites mainly result from the failure of worm-infested pigs to make profitable return.

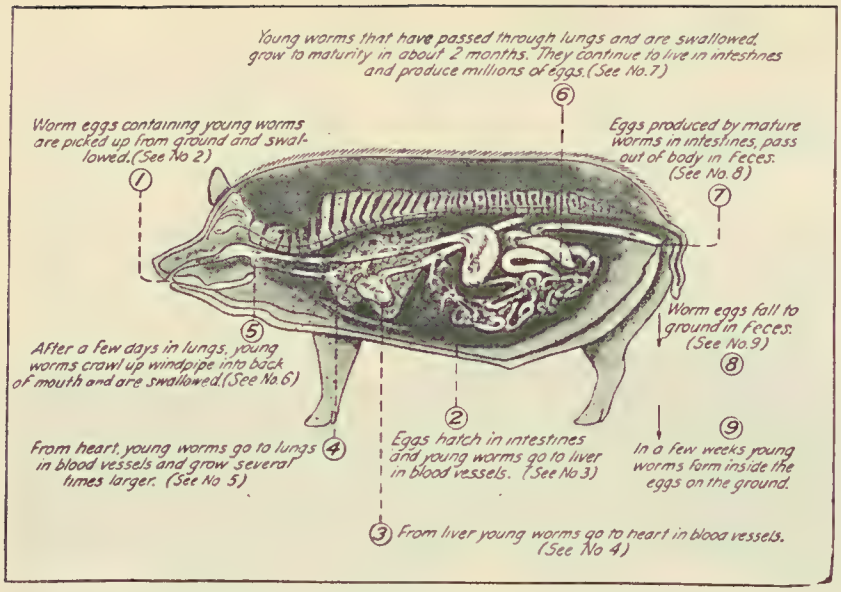
Losses also may occur from the death of grossly infected pigs and from the rejection and condemnation at abattoirs of edible parts of the carcass. In other countries some parasites are communicable to man, and parts of carcasses invaded by them must be destroyed.

The internal parasites of swine include four general groups known as flukes, tapeworms roundworms, and protozoa. Of these the first three groups are worm parasites. Flukes and tapeworms occur far less frequently than roundworms, which cause the greatest loss. The occurrence of protozoa, which are single-celled organisms, is widespread and under certain circumstances these may be injurious.

Roundworms are the most injurious of the worm parasites which infest pigs. The adult forms may cause tissue damage where they attach themselves, and the larval stages migrate extensively through the body, causing considerable damage to the organs through which they burrow. Roundworms are cylindrical, elongated worms and both male and female forms are found, the female being invariably the larger.

Large Roundworm (Ascaris lumbricoides)

The large roundworms are yellowish white in colour and fairly rigid. The females may be up to 15 inches long and are prolific egg-layers, one female producing daily up to 200,000 eggs.


Young worms that have passed through lungs and are swallowed, grow to maturity in about 2 months. They continue to live in intestines and produce millions of eggs. (See No. 7)
Worm eggs containing young worms are picked up from ground and swallowed. (See No 2)
Eggs produced by mature worms in intestines, pass out of body in Feces. (See No. 8)
After a few days in lungs, young worms crawl up windpipe into back of mouth and are swallowed. (See No. 6)
Worm eggs fall to ground in Feces. (See No. 9)
From heart, young worms go to lungs in blood vessels and grow several times larger. (See No. 5)
Eggs hatch in intestines and young worms go to liver in blood vessels. (See No 3)
In a few weeks young worms form inside the eggs on the ground.
From liver young worms go to heart in blood vessels. (See No 4)

The path followed by Round Worms in the body of a pig.
[After *Ransom.*

The life cycle is direct. Under optimum conditions of temperature and humidity, larvae develop in the eggs and, in about ten days, are capable of infecting other pigs. The eggs are resistant to drying and freezing and they may remain alive in muddy wallows up to two years. When exposed to hot, dry conditions however, as in sandy soil under direct sunlight, they are destroyed in a few weeks.

Pigs are usually infected by swallowing the developing eggs with food, or by suckling sows' teats that have been soiled with faeces. The eggs usually hatch immediately after ingestion and the young larval worms are liberated in the small intestine. They burrow into the bowel wall producing minute haemorrhages and thence pass, via the bloodstream, into the liver where they wander before being carried again in the bloodstream, to the lungs. In several days they are coughed up in bronchial mucous, are swallowed and pass into the stomach and small bowel where they grow to maturity some eight or nine weeks after infection occurs.

During their migration, the larval worms produce tiny haemorrhages in the small intestine and damage the liver tissue, producing white areas, or "milk spots," which consist of fibrous tissue. In the lungs, the young worms may cause ill-effects varying from small haemorrhagic spots to extensive pneumonic areas, often involving complete lobes.

The adult worms in the small intestine feed on the bowel contents and the mucous lining, which may show superficial ulcers, exposing the area to bacterial infection. In heavy infestations, masses of worms may actually produce intestinal obstruction.

Symptoms shown by the infected pigs depend on the severity of the infestation. Usually only young pigs up to four or five months are seriously affected. In severe cases, a rise in temperature and increased respiration, known as "thumps," indicate the onset of pneumonia, which results from the destruction of lung tissue by the larval worms. Death of very young pigs may follow in about a week. In less severe cases, an affected pig has a short, harsh frequent cough which quickly becomes evident on exercise. These pigs remain unthrifty, have a dull coat and are always stunted.

Red Stomach Worm (Hyostrongylus rubidus)

The red stomach worm is difficult to see, being slender and hair-like and $\frac{1}{3}$ inch long. The life cycle is direct, in that no intermediate host is necessary for the completion of the worm's development. The eggs are voided in the faeces, hatch in one to two days, and become infective for pigs in about six days. At this stage the larvae are protected by a sheath, which enables them to survive under adverse conditions for several weeks.

Pigs become infected by feeding over contaminated areas, the worm larvae being swallowed in food or water. In the pig's stomach the worms become mature in three to four weeks; mating occurs and egg-laying follows.

Only in heavy infestations are pigs obviously affected. Diarrhoea is followed by depressed appetite and wasting. Death may supervene. Post-mortem examination of severe cases may show severe ulceration of the stomach.

Whipworm (Trichuris trichiura)

Whipworms are so named because the anterior portion is slender and about twice as long as the thicker posterior portion. The worms are whitish, up to 2 inches long and are found in the caecum of the pig, where they are attached by

deeply embedding their heads into the bowel lining. The occurrence of *Trichuris* is widespread, small numbers being found in most pigs. Eggs are voided on to the soil where development proceeds slowly, even under favorable conditions. They become infective for pigs in about four weeks. Having been swallowed, the developing larvae pass to the caecum, where they attain maturity in about ten weeks.

Usually a moderate infection produces no ill effects, but heavy infestations may produce severe inflammation of the caecum with a thickening of the caecal wall and in some cases, death of the pig may result. In other cases there is retardation of growth and unthriftiness.

Nodule Worms (Oesophagostamum dentatum)

The abovementioned is the most common species of the nodule worm found in pigs. The adult worms are found in the caecum and large bowel and are slender, whitish parasites measuring up to ½ inch long. The immature forms are found in the walls of the bowel where they produce the nodules from which the worm derives its name. The life cycle is direct; the eggs hatch when voided and are infective in three to five days.

Infective larvae seek out moist conditions and will migrate deeply into the soil layers if the surface becomes too dry.

If infective manure is dug into the soil the larvae will migrate to the surface when conditions there are suitable. Larvae are able to survive twelve to fourteen months under these conditions.

Pigs become infected by swallowing the infective larvae which pass to the large bowel and there burrow into the bowel wall where nodules are produced. These increase in size as the larvae develop.

After two to three weeks, this stage of development is complete and the larvae pass back into the bowel to become mature, mate and lay eggs.

The presence of nodules mechanically interferes with normal bowel function and leads to faulty food absorption. Larvae in the nodule are considered to produce toxic substances which are absorbed into the pig's system, and bacteria may invade and set up infection within the nodules. In severe infections, anaemia, diarrhoea and unthriftiness occur.

Nodule infested intestines are not suitable for sausage casings.

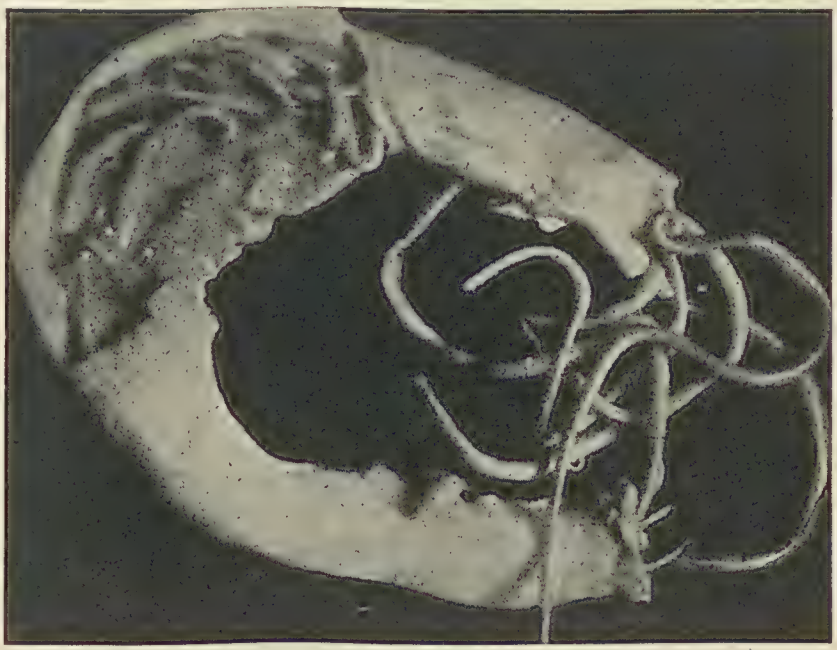
Kidney Worm (Stephanurus dentatus)

In all the pigs in Victoria in which the kidney worm has been found, it is believed that the animals were introduced from New South Wales or Queensland where this parasite is widespread. It causes considerable tissue destruction leading to the trimming and condemnation of much affected flesh.

The mature worms are thick, about 2 inches long and brownish or white in colour. They are found in the kidneys, the ureters (tubes conveying urine from the kidneys to the bladder) and the fat tissue overlying these organs.

The eggs are laid and pass with the urine on to the soil, where they are rapidly destroyed if exposed to sunlight. If they remain in a moist shaded area, the embryos rapidly hatch and in three to five days develop into infective larvae.

Pigs become infected, either by swallowing the larvae or by the larvae entering the animal's body by burrowing through the unbroken skin. Having entered the pig's body, the larvae pass



A section of a pig's intestine infested with Round Worms.
[After *Dep. Agric., Ontario,* Bull. No. 340.

into the bloodstream which conveys them to the liver, lungs and other organs. Those reaching the liver burrow in through the substance of that organ and remain there for a period of four to five months, producing much liver destruction which results in the laying down of scar tissue. Many of the larvae degenerate during this period. Others leave the liver and migrate to the kidneys and ureters into which they burrow. In these sites, the worms embed themselves and become adult about seven months after the initial infection.

Rarely does the kidney worm cause obvious symptoms, although when the worms lodge in the spinal cord they may cause paralysis, especially of the hindquarters. Affected pigs are unthrifty and grow less rapidly as the result of more or less extensive liver destruction.

Livers, freshly damaged, show unhealed lesions that may contain live worms or pus. As the lesions heal they become white, and in bad cases the liver becomes much distorted, shrunken and is covered with white areas of fibrous tissue. In young pigs, death may follow extensive liver destruction.

In the kidneys, the presence of adult worms frequently leads to the formation of cysts, which may often be pus-filled. As the cysts increase in size, the surrounding normal kidney tissue is destroyed and its function is progressively impaired.

In the ureters, inflammation may be so extensive as to block the passage leading to urine retention, which further impairs the efficiency of kidney function.

In addition to dead and unthrifty pigs, losses occur also from the serious wastage incurred by the condemnation of livers and trimming out kidneys and other affected portions of otherwise edible meat.

Lungworms (Metastrongylus apri)

Lungworms are white and threadlike, and are about 2 inches long. They are found in the small air passages of the lungs where the eggs are laid. The larvae hatch almost immediately, are coughed up in the bronchial mucous and swallowed. They pass in the dung to the ground where earthworms ingest them. The larvae develop in the earthworms for three to four weeks and are then infective for pigs. Swine become infected by ingesting these earthworms.

The pig's digestive juices liberate the worm larvae which pass, via the bloodstream, to the lungs where they become mature in about six weeks and commence to lay eggs.

It is known that under moist, shaded conditions, larvae will survive for two years. Hot, dry conditions, however, will destroy them in a few weeks.

The presence of worms in the air passages produces an irritation. Where many worms are present they may completely block a bronchiole and later produce an area of pneumonia. Even light infections produce coughing, which is more severe after exercise. Affected animals go off their feed and become unthrifty.

Trichinosis

Trichinosis, which is communicable to man, has not been reported in Australia. The condition is caused by the larval forms of the worm, *Trichinella spiralis*. The adult worms occur in the small bowel of man, the pig, rat and other mammals.

After mating, the female worms pass through the bowel wall and lodge in the tissue spaces, where egg-laying commences. Eggs hatch immediately and are distributed throughout the voluntary muscles of the body by the blood and lymph streams. Within the muscles, the larvae become encysted where they may remain alive for years.

An animal becomes infected with the adult worm by eating meat containing living larvae. Pigs become infected by eating uncooked, infected pork scraps or the bodies of diseased rats. In man, infection occurs following meals containing partially cooked pork, or some types of pork sausage which do not require cooking.

The disease is marked by diarrhoea, fever and acute muscle pains. As trichinosis is so easily confused with other febrile conditions, it is seldom diagnosed.

There is no known treatment.

In the United States of America, it has been shown that pigs fed on grain are infected with trichinae much less frequently than pigs fed on uncooked food refuse, such as may be collected from hotels and other eating places. When, however, this garbage is sterilized by thorough boiling, the incidence of the disease in the pigs is as low as that found in grain-fed pigs.

In this country at present, the possibility of outbreaks of trichinosis occurring among pigs is just as likely as the possibility of outbreaks of swine fever. For this reason, it is imperative that all refuse fed to pigs should be thoroughly boiled before the pigs have access to it.

Control of Roundworms

The majority of the parasitic worms in pigs are difficult to remove. For example, there is no drug in use which has any reliable effect on kidney or lung worms, which are protected by their location.

Worms in the large bowel are difficult to treat, because most drugs are either changed or absorbed while passing through the small bowel. Drugs have no effect on the immature worms and these will develop and, in spite of dosing, carry on the infection.

A healthy pig and a wormy pig. These two pigs are from the same litter and are seven months' old.

Control by dosing alone, therefore, can only be achieved by an uneconomic series of frequent treatments. Perhaps the chief value of treatment by drugs is to prevent the introduction of gross infection by treating newly introduced pigs. These pigs should be held and treated in pens from which voided worms and faeces can be destroyed. The judicious use of drugs may also enhance control of parasites by improved methods of sanitation, which aim at the prevention of infection rather than cure.

Of the many drugs used, best results have been obtained from the following :—

Oil of chenopodium is most effective against the Large Round Worm, *Ascaris* spp. As the drug is dangerous, care must be taken in its administration. It is most readily given, mixed in castor oil, by means of a drenching gun or syringe. The drug itself may be given in a capsule and the castor oil administered separately, but this method possesses no advantage over dosing of the mixture.

The dose recommended is :—

For 25-lb. pig 1 c.c. in 1 oz. castor oil.
50-lb. pig 2 c.c. in 1½ oz. castor oil.
75-lb. pig 3 c.c. in 2 oz. castor oil.
100-lb. pig 4 c.c. in 2½ oz. castor oil.
150-lb. pig 6 c.c. in 3 oz. castor oil.

Pigs should be starved for 24 hours prior to dosing. In severe cases, dosing should be repeated in two weeks to remove worms which have become adult since the previous treatment.

More recently, phenothiazine, has been shown to be effective against the nodule worm, *Oesophagostomum* spp., but its efficiency against *Ascaris* spp. is variable. Phenothiazine is most readily given mixed in the feed, but this method is not to be recommended, as some pigs will take more than their share and others not enough. Pigs may refuse it unless very hungry. In some cases, starvation for two to three days is necessary before pigs will take the medicated feed. As phenothiazine preparations, readily miscible with water, are obtainable, it is suggested that individual drenching will prove the most satisfactory method of administration. Whereas oil of chenopodium is at present in very short supply, relatively plentiful stocks of phenothiazine preparations are available.

The dose rate of phenothiazine recommended for a pig :—

Up to 20 lb. is 5 gm.
20– 40 lb. is 5–10 gm.
40– 80 lb. is 10–20 gm.
80–160 lb. is 20–40 gm.
Greater than 160 lb. is 40 gm.

At least two treatments, at two weeks interval, are necessary in cases of heavy infections.

Sanitation

Although the use of drugs offers no hope of complete control of parasites in pigs, excellent results can be assured by improving the sanitation of piggeries. On most piggeries, existing sanitation leaves much to be desired. Pigs of all ages are frequently allowed to run together in old, badly drained yards. Muddy wallows and yards littered with refuse of all kinds are evidence of poor methods of pig husbandry. Feed and water troughs in which pigs can stand and dung are indications of bad management.

The following plan is based on a knowledge of the life cycles of roundworms, especially of the large roundworm. Its aim is to prevent the infection of pigs:—

1. Sties on the piggery should be of sound construction to facilitate cleansing. Floors should be of concrete, with a raised wooden floor for sleeping quarters. This will ensure proper drainage of urine away from the sleeping quarters. Earth floors are bad, in that they are always moist with urine and dung, and provide excellent conditions for development and survival of worm eggs and larvae.

2. Drainage from sties and yards should be complete. There should be no depressions which may become wallows.

3. Sties should be washed down and cleansed of dung each day. The dung should be spread on pasture to which pigs will not have access for two years at least. Dung removed in this way will prevent the breeding of flies, and will ensure that all worm larvae are dead before the pigs are allowed access to the pasture.

4. Feed and water troughs should be raised, and so arranged that pigs cannot stand in them. For pigs running on pasture, self-feeders are advocated.

5. As a further precaution, sties should be disinfected at regular intervals with 5 per cent. Kerol, Dettol, or similar type of antiseptic in boiling water.

6. Young pigs after weaning should always be placed on clean ground.

McLean County System

The McLean County system is an efficient and practical method evolved in The United States of America, by which worms in pigs can be controlled. It is based on the fact that young pigs gradually develop a marked resistance to infestation with *Ascaris* spp., and by the time the pigs are four to five months old, it is very difficult for the worms to become established in the pig's bowel. Briefly, the McLean County System aims at keeping young pigs away from heavily infested ground until they are four months old. In this regard, the success achieved by a farmer will depend on how closely the details of the plan are followed.

About five days before the sow is introduced, the farrowing pen, which should be of sound construction, is washed down and thoroughly disinfected, using 5 per cent. Kerol or Dettol in boiling water. The sow is thoroughly washed with warm soapy water to remove all dirt, particularly from the teats and feet.

The sow is then *carted*, not driven, into the sty. This prevents contamination of the feet with soil and worm eggs or larvae. If necessary, the sow may be dosed for worms two to three days before being placed in the sty. Until the sow and her litter are moved from it, the sty should be washed down thoroughly each day.

Depending on the ground available, there are now two alternatives—

1. On properties where farm crops are grown, the ideal is to have three pasture paddocks which can be used in rotation. In this way, each pasture is used only once in three years as a pig paddock. The other years it is cultivated and a farm crop grown, and then sown down to pasture for the pigs. By this means the pasture is freed of worm contamination and has also produced crops.

The paddock to be used is divided into two parts, not necessarily equal. The sow and her litter are *carted* to this pasture, and placed in the first portion. A movable A-type shelter (so-called by reason of its shape) is provided for each sow. The age at which the sow and litter are placed on the pasture, depends on the number of litters. When only a few sows are in the paddock, young litters may be placed out at ten days, but when there are many sows, it is advisable to wait until the suckers are three weeks old, as the older suckers will starve young piglets. When the litters are weaned, the sows are taken away and the young pigs are placed in the other division of this pasture, where they remain until ready for fattening or sale as stores.

By the use of a fresh pasture each year, no pasture carries pigs for two years in succession.

2. Where available ground is not sufficient for pasture rotation, each farrowing pen should have its own yard. This yard is prepared by removing the top layer of soil to a depth of 9 to 12 inches, and replacing it with fresh soil, preferably sand, from an area not frequented by pigs. The young pigs only are allowed the use of this yard, where they remain after weaning, until such time as they are ready to fatten or sell as stores.

By these methods the young pigs are reared in an environment free of worms. The wastage and economic losses caused by the presence of these parasites are overcome, and the farmer will produce pigs of the required type more quickly, more economically and with more profit to himself.

Liver Fluke (Fasciola hepatica)

The liver fluke is the most common variety of fluke in Australia. It is found in the bile ducts, chiefly of cattle and sheep. It occurs very infrequently in the pig, however, and its importance in this animal is therefore only slight.

Information concerning fluke in cattle and sheep, may be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Tapeworms

Tapeworms occur in swine, only in the form of cysts. In this stage they are termed "bladder worms." The cysts represent the intermediate stage in the life cycle of the worm. The adult worms occur in the bowel of the definitive host.

Pork Measles

The condition known as "pork measles" is due to *Cysticercus cellulosae,* which is the intermediate stage in the life cycle of the human tapeworm, *Taenia solium.* Pigs become infected by feeding over areas contaminated by ripe worm segments, voided in the faeces of infected human beings.

In the pig's intestine, tiny worm embryos hatch from the eggs contained in the swallowed segments. These embryos bore into the bowel wall and pass into the bloodstream, by which they are carried into the muscle capillaries, where they lodge and become surrounded by a capsule of white connective tissue.

At first, they are about the size of a grain of tapioca and grow to a length of $\frac{3}{4}$ inch, by $\frac{1}{2}$ inch wide. These measles are found chiefly in the muscles of heart, diaphragm, abdomen, throat, tongue and the muscles of mastication.

Only in severe cases are ill-effects seen, and these symptoms are due to pressure of the cysts on surrounding sensitive tissues. The snout may be unduly sensitive, the tongue paralysed and eventually the animal will become unable to eat and will starve. Usually, however, the condition is not diagnosed until the animal has been killed for meat.

Pork measles has not been recorded in Australia.

Hydatids

The hydatid cyst, *Echinococcus granulosus,* is the intermediate stage in the life cycle of a tapeworm, which occurs in the dog. In the human, the hydatid cyst is the cause in that serious condition, hydatid disease.

In the pig, the hydatid is commonly found in the liver, lungs and other large organs. The size varies up to that of a walnut. By pressure and by displacing normal tissue, the hydatid may be considered injurious in pigs, especially when located in the liver. The presence of cysts renders the meat unfit for food.

Pigs, together with sheep and cattle, act as the reservoir from which dogs become infested. When dogs eat uncooked offal containing hydatid cysts, the cyst wall is digested, liberating the young tapeworms which then develop in the dog's intestine. Ripe tapeworm segments containing the eggs are voided in the dogs' faeces. Man, sheep, cattle and pigs may swallow these eggs with food or water and so become infected.

As hydatid disease in man is a serious condition, every precaution should be taken to prevent the infection of dogs, since man can become infected only by contact with dogs which carry the tapeworm.

It is imperative, therefore, on farms where swine or other animals are slaughtered, that no offal be fed to dogs, unless it has first been thoroughly boiled for at least ten minutes. This will ensure that all cysts are destroyed. The regular dosing of all dogs with arecoline hydrobromide will effectively remove all adult tapeworms from the dogs' bowels.

If these measures are carried out there should be no risk of hydatids developing in humans or animals. Full information concerning the control of hydatid disease can be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Slender-necked Hydatid (Cysticercus tenuicollis)

The slender-necked hydatid is the intermediate stage in the life cycle of a common tapeworm of the dog, *Taenia hydatigena.* This hydatid occurs commonly in the sheep, and occasionally in the pig. Although it is sometimes found in the liver, it is more often attached to the abdominal organs, or free in the abdominal cavity.

Some workers state that migrating forms may cause such liver damage as to kill young pigs. The life cycle of this parasite is similar to that of the hydatid, *Echinococcus granulosus.*

There is no known treatment for any of the bladder-worms. Methods of control aim at the treatment of dogs; the cooking of all offal fed to dogs; pigs should not have access to soil heavily contaminated with the faeces of dogs.

War Agricultural Committee Notes

Compiled by THE CENTRAL EXECUTIVE

WITH the need for restricting normal production of civilian requirements so that the manufacture of goods needed by the Services can be met, it has been necessary to control the sale and distribution of many commodities. Farmers are unfortunately only too familiar with the varied nature of the methods adopted by the different authorities to control such commodities.

A brief *résumé* of the procedure necessary for the release of farmers' requirements may be of value and some examples are given hereunder. In many cases, the producer has only to lodge his order with the local retailer, who then applies to the appropriate Department, but in those instances where a more rigid control of distribution is desired, the War Agricultural Committees are required to certify to the essentiality of the claims. In all cases, however, the controlling authority retains the right to refuse the supply of any commodity which it considers is not necessary.

Accommodation

Building Permits.—A written application, stating full details of building and the estimated cost, should be forwarded to—

The Deputy Director,
Department of War Organization of Industry,
187 Collins-street,
Melbourne, C.1.

On request from the Deputy Director, the application will be examined by the War Agricultural Committees and a recommendation given. To facilitate investigation, applicant may place his case before the local committee at the same time as he writes to the Department of War Organization of Industry.

Materials Supply

Ammunition Supplies.—Each primary producer is entitled to 25 12-gauge shotgun cartridges, or 50 ·22 rimfire rifle bullets, to destroy certain stipulated pests. This issue is obtained by applying to the nearest police station for a permit. This permit is lodged with the retailer with an order for the ammunition. Ammunition can be obtained only on presentation of a permit issued by the police. The police will issue permits only to primary producers for the destruction of certain pests. Unless sponsored by the Local War Agricultural Committee Chairman, only one permit for 25 shotgun or 50 rimfire cartridges may be issued to each primary producer per year.

Bailing Wire.—Applications should be made to the Local War Agricultural Committee stating quantity required and the retailer and wholesaler supplying it. These applications will be forwarded to the Chairman of the Regional Committee who will summarize all received and forward them to the Department of Agriculture to be listed for release by the Directorate of Materials Supply.

Electricity.—Application should be made on special form obtainable from the Local Electricity Supply Authority. The form when completed by the applicant will be endorsed by the supply authority and then by the Regional War Agricultural Committee. Each application will be considered by these bodies in collaboration.

Fencing Material (Ungalvanized wire only).—The only types of fencing material available at present are:—

(*a*) Steel Posts, 5 ft. 6 in. long.
(*b*) Barbed Wire, 12½-gauge.
(*c*) Plain Wire, 10-gauge and 12½-gauge H.T.
(*d*) Wire Netting—
12 in. x 1½ in. x 17 in.
42 in. x 1½ in. x 17 in.
42 in. x 2 in. x 17 in.
(*e*) Pig Fencing Ringlock high tensile (8 wire x 30 in.).

All above material is under control of the Directorate of Materials Supply, Ministry of Munitions, which issues release orders on the recommendations of the Department of Agriculture. Applications should be made on specified form available from the local retailer or the Department of Agriculture and should be forwarded after completion to—

Director of Agriculture,
Public Offices,
Melbourne, C.2.

Fibro Cement Sheets.—Controlling body—

Directorate of Materials Supply,
532 Bourke-street,
Melbourne, C.1.

Applications should be lodged with local merchants on special form and certified by the Local War Agricultural Committee as essential.

Nails, Nuts and Bolts, Screws, and Horse Shoes and Nails.—Controlling body—

Directorate of Materials Supply,
(Address above).

Applicant lodges his order with the local retailer and forwards to the above Directorate a copy of the order together with details of purposes for which required.

Petrol.—Applications should be made direct to the Local Transport Advisory Committee.

Rubber Boots.—Controlling body—

Controller of Rubber,
Chancery House,
485 Bourke-street,
Melbourne, C.1.

Application should be made on special form available from retailer. This should be lodged with him together with an order. These will be forwarded to the manufacturer who will refer to the Controller of Rubber for authority to supply.

Rubber Hose Piping.—Controlling authority—

Controller of Rubber,
(Address above).

Applicant should write to the Controller of Rubber stating—

(*a*) Name and address of applicant.
(*b*) Retailer, manufacturer, and brand of hose.
(*c*) Length and diameter of hose.
(*d*) Purposes for which required.

Authority will be given for the sale of hose if the release is approved.

Spare Parts.—(*a*) *Tractor.*—Lodge order with retailer and make application in writing for release of part to—

Controller of Machine Tools and Gauges,
499 Little Collins-street,
Melbourne.

(*b*) *Automotive.*—Lodge order on special form available from retailer. If priority high enough and part available it will be supplied immediately from wholesaler. The address of the Controller of Automotive Spare Parts is—

Chancery House,
485 Bourke-street,
Melbourne, C.1.

Tyres.—Controlling Authority—

Controller of Rubber,
(Address—See column 1 this page).

(*a*) *Car and Truck.*—Applicant completes prescribed form, available from supplier and submits it to the Local Transport Advisory Committee. If transport of high priority crops is held up or likely to be held up, the applicant may request the Local War Agricultural Committee to sponsor his case when the form will be endorsed by the Chairman, before submitting it to the Transport Advisory Committee, stating special reasons for sponsoring. The application will then be forwarded to the Controller of Rubber, who, in collaboration with the Directorate of Emergency Road Transport, will consider authorization of supply.

(*b*) *Tractor.*—Application made on prescribed form to the Controller of Rubber. Applications are referred to War Agricultural Committee for recommendation.

Manpower

Releases from Service.—Applications should be made in writing to the National Service Officer and at the same time the Service member should make application to his C.O. This applies whether release is for seasonal work or permanent discharge. A supplementary application may be made to the Local War Agricultural Committee when this body will submit a confidential report on the case to the National Service Officer.

IT'S A BUSINESS PROPOSITION
TO HELP YOUR NEIGHBOUR

Revival of the Pig Industry

By L. A. DOWNEY, H.D.A., Pig Expert

THE Commonwealth Government urgently appeals for a big increase in the production of pig meat, particularly that from baconer pigs, to meet increasing demands including those of the fighting services, the United Kingdom, and Australia's civil population.

Pig production has not been at its maximum capacity in Australia during the past year; factors limiting production included the farmers' fear of unstable pig markets, and the uncertainty of supply and relatively high cost of cereal grains and meals for pig feeding.

Realizing these limiting factors, the Commonwealth Government has recently taken measures to remove them.

A big increase in the production of this type of baconer is required.

On the 4th September, 1943, the Minister for Commerce and Agriculture announced an increase of 1d. per lb. in the price guaranteed by the Government for first- and second-grade bacon pigs under the Pig Meat Acquisition Plan. The Minister also announced that the maximum weight for baconer carcasses under the Plan had been further increased to 200 lb., thus, baconers under the Plan are from 101 to 200 lb. carcass weight, and pig raisers are guaranteed by the Commonwealth Government, prices ranging up to £7 10s. per head for first-grade heavy baconers delivered to works. This price, when compared with past values, is very attractive, especially as it is guaranteed until 30th June, 1945, and is subject to twelve months notice before alteration.

Pig raisers, naturally, will want to know if the price of pig foods will be kept in favorable relation to the fixed prices of pigs, because any stated price of pigs has little significance, except in relation to production costs, and among these food is the main item.

In this respect, the Commonwealth Government has realized the position, and taken steps to reduce further the cost of wheat to pig raisers by making it available through the Australian Wheat Board, at a maximum cost of 3s. 6¾d. per bushel in railway truck lots delivered at purchasers' railway sidings anywhere in Victoria. This price is made possible by the Commonwealth Government subsidizing the Wheat Board's sales of wheat for stock feeding by 6d. per bushel, and by subsidizing delivery costs so that farmers in districts distant from wheat-growing areas will not be unduly penalized by freight charges.

With wheat costing 3s. 6¾d. per bushel in truck lots at purchasers' sidings, it should be possible for all pig raisers in Victoria to land wheat at their piggeries at a cost very favorably related to the prices guaranteed for bacon pigs.

The increase in supplies of pollard, which are expected as a result of milling wheat for export flour orders, should also have a favorable effect on the future supply of pig foods.

Recognizing these substantial inducements, pig raisers should now respond by increasing their pig production to the utmost limit of their capacity. There will still be obstacles for pig raisers, but by the application of ingenuity and co-operation, these can be overcome and the required quantities of pig meats can be produced.

The first step is to increase the average slaughter weight of pigs. This will give an increase in the supply of pig meats in the near future, and by mating more sows now, there will be more pigs available for slaughter in the summer of 1944.

To increase the weight of pigs for slaughter without seriously affecting carcass quality, requires skilful feeding. This problem is dealt with in the Live Stock Notes in this issue.

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Preparations for conserving surplus spring growth should be completed this month.

Dairy Cows

THE success attained by the owners of high producing dairy herds, is the result of good herd management and feeding, in addition to good breeding. For the members of a herd to give best yields, they must be well fed and cared for, from birth—as calves, growing heifers, and during pregnancy. It is by no means sufficient, to commence to look after a cow from the time she calves. She must receive ample food and proper attention continuously.

In addition to being properly cared for, the cows in high producing herds are well bred, and the factors associated with good breeding are :—

Continuous herd testing so that the exact production of each cow can be determined.

The selection of the most desirable, highest producing cows for breeding purposes.

The culling of all low producing cows and strains as soon as they can be replaced by heifers from higher producing cows.

The selection of suitable sires and the increased use of proven sires.

Line breeding with known high producing strains, associated with intermittent outcrossing.

Since the outbreak of war, herd testing facilities in Victoria have been reduced. Less than one-third of the cows tested annually before the war, were tested last year, and many herds have deteriorated in consequence. In New Zealand, herd testing has been increased, and the herd testing organization has been used to increase dairy production. Herd testing has been expanded there during war-time, by the employment of female testing officers; the New Zealand Dairy Board reports that 180 of the 220 testing officers employed, are women.

Selection is vital when building up a dairy herd and maintaining it at a high level of production. It is difficult for a person just starting dairying to buy all good cows, and thus have a ready-made herd. For best results, he must purchase the best he can, and immediately commence to breed his own stock and build up his own herd by using as good a bull as possible, and then selecting the heifers from the best producing females, to take the place of the low producers.

The best cattle to buy are those from an old, well-established herd, where the average production has been high for a number of years. Since proven sires are usually unprocurable, the bull to be bought should be one from a cow that is not only a high producer herself, but has tested daughters which are also good producers.

Culling has to be practised in every herd to eliminate the unprofitable cows, but the selection

of the highest producing, best breeding cows and retaining their progeny for replacing the culls, is often neglected.

Dairy cows, in fact all animals, inherit half their characteristics from their sires and half from their dams, but, frequently it is observed that the progeny apparently take after one parent. This is due to the prepotency of that particular parent. Prepotent individuals transmit a large percentage of dominant characters, which show out in the progeny over the recessive characters inherited from the less prepotent parent.

The bull is often referred to as "half the herd," and, where he is the sire of all the calves, this is true from the genetic point of view. Therefore, a sire, prepotent as far as high milk and butterfat production is concerned, is desirable. Such a sire will have a high "bull index," and will be known as a proven sire.

There is a strong tendency to breed from cows with phenomenal records, and to use these records as propaganda when selling their descendants, but, unless the progeny inherit the characters for high production, they are no better than the progeny of ordinary cows.

Linebreeding, is the mating of distinctly, but distantly related animals, and when the common ancestor (or ancestors) is known to be transmitting high production, this method of breeding is desirable. To ensure against any loss of vigor or vitality, an outcross should be introduced every third or fourth generation.

Crossbreeding also gives good results in commercial herds, and it is noticed that in the Cohuna Herd Testing Association last year, the leading herd owned by Mr. A. Lee was crossbred, a Jersey bull having been used on Shorthorn cows, many of which were pure-bred. This herd of 34 cows produced an average of 9611 lb. milk, and 413 lb. of butterfat. The second herd, owned by Mr. W. Hornsby, was also crossbred and produced an average of 9193 lb. of milk and 409 lb. of butterfat for 44 cows. In this case, a Jersey bull was used on pure-bred and grade Friesian cows. Both of these crossbred herds produced remarkably well, and were right out on top, the third herd producing 340 lb. of butterfat, and the average of the 968 cows tested in the Association, being 287 lb. of butterfat.

Pasture hay is the cheapest and most easily procured supplementary fodder for the dairy herd.

Sheep

In the breeding of sheep, the results are influenced by environment as well as inherent genetic factors. Environment covers the care and feeding of the sheep from birth.

Differences in feeding have been studied by officers of the Council for Scientific and Industrial Research, at the Animal Nutrition Laboratory, Adelaide, and the effects on the growth and development of the sheep, and the growth and quality of the wool produced, have been tremendous with both fine and strong woolled Merinos. At the commencement of these experiments, strong woolled Merino twin ewe lambs, just weaned, were selected, and one twin was placed on a high level of nutrition, and the other on a low level of nutrition which was very little better than a maintenance ration. As so few twins are produced by fine woolled Merinos, it was not practicable to use all twin lambs of this breed, but ewe lambs of similar age, weight, and appearance were reared on rations at the two nutrition levels.

Many of the results obtained from these experiments were believed previously to be due to inheritance, and not to the fact that, because the lambs were reared under the same conditions as their parents, they appeared similar to their parents and other members of the flock. The sheep reared on a high level of nutrition were large and well grown, producing a long staple of relatively strong wool, whereas, those on the low level were smaller, producing a short staple of relatively fine wool. Although the breed differences in regard to wool remained, there was a very large variation in the fineness of the wool in each group within each breed.

The amount of wool produced, bore a close relationship to the nutrition level, and the rapid increase in wool production at levels of feeding above maintenance shows that, during long periods of hand-feeding in drought times, it will be more economical to feed slightly in excess of

bare maintenance requirements, as the value of the increased wool production more than pays for the extra feed.

Many of the qualities attributed to breeding were found to be greatly influenced by the conditions under which the sheep were reared, and the amount and type of wool produced, bore a well defined relationship to the level of nutrition.

From these experiments it is apparent that a pastoralist desiring to breed sheep to produce a particular type of wool, should select sires from a flock reared and maintained under conditions similar to his own and producing the desired type of wool.

Pig-raisers cannot afford to slaughter pigs in this light condition. They should be taken on to heavier weights.

Make Pigs Even Heavier for Market

As reported elsewhere in this issue, there is an urgent necessity for increased production of pig meats, and conditions have been substantially improved to enable farmers to achieve the required increase.

The immediate problem of dairying pig-raisers, is to make the best use of their relatively few pigs by taking advantage of the improved conditions of cereal food supplies and increased pig prices, and, at the same time, dispose of their heavy summer supply of separated milk.

By mating more sows to farrow next autumn, and thus providing more pigs for fattening in the spring of 1944, some extra food will be used in the coming summer, but the immediate programme should be to carry all pigs to heavier weights before marketing them.

If all pigs were held on farms for an extra month's growth, the supply of pig meats would be appreciably improved in the near future, and farmers would obtain some early benefit from the improved economic conditions of the industry.

In holding pigs until they reach heavier weights, care should be taken to make them bigger, but not fatter. This can be achieved by keeping their food allowance at the same amount daily, after they have reached the desired degree of fatness for slaughter. For example, if pigs weighing 200 lb. alive (about 140 lb. dressed) are given as much as they can eat, they may consume 4 gallons of separated milk and 3 lb. of grain per head daily, and on such a diet, they should be gaining weight at the rate of 2 lb. per head daily. If, instead of being marketed at this weight even though they are fat enough, they are kept for another month on the same daily allowance of food, they will reach about 240 lb. live-weight (about 180 lb. dressed), and will be longer in the body, but not much fatter, because their growth rate will have gradually reduced to about 1 lb. daily.

As there is a substantial price penalty, under the Pig Meat Acquisition Plan, for pigs weighing more than 200 lb. dressed weight, a maximum live-weight of 250 lb., between feeding times, on the farm should be aimed at by pig-raisers.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry

Now that the hatching season is practically over, as much time as possible should be given to the care and requirements of the growing stock.

With increasing temperatures towards the summer months, the young birds should not be kept under artificial conditions any longer than necessary, but should be placed on open range at the earliest convenient opportunity afforded by the weather conditions.

Breeding stock mated during the early part of the season, must not be used too long as this leads to the production of weak chickens.

Hatching and rearing appliances should be thoroughly cleaned in readiness for the next season.

Beginners in poultry farming are advised to build up their flock with strong and healthy birds, bred from a good laying strain known to be free from disease, and to maintain the quality of the stock from year to year. Certain individuals

[*Continued on page* 499.

NAVY BEANS—*More Required!*

Notes by Officers of the Horticultural Division

THE Commonwealth Government, requiring greatly increased quantities of Navy beans for Defence purposes, has set a target of 7,500 acres for Victoria. This is more than double the area sown last year, but it is fully anticipated that Victorian farmers, who have so far met practically all demands made on them for wartime crops, will again make it possible for the State to reach the target. Several new provisions this year make the production of Navy beans more attractive to growers.

Some growers' crops last year were unduly delayed by the heat-waves in December and January, which caused a shedding of the earlier blossom and delayed harvesting until the break in the weather. It is certain, however, that the Navy bean will become established as a valuable crop in this State and that given reasonable weather it will compete economically with other crops available to growers in those parts of the State where reasonable summer rains are obtained and where beans may be expected to grow well. While it is the desire of the Government that Navy bean growers should find production profitable—and the price has been raised to this end—the appeal to Victorian farmers to grow Navy beans is based not only on economic grounds but also on patriotic grounds. It is hoped, wherever possible, growers will again come forward and produce this crop so essential to our Defence needs. Applications for contracts should be made to the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

Price per Bushel

The price has been increased by 10s. per bushel for all grades, so that for beans of 98 per cent. canning quality 35s. per bushel will be paid. This is in accordance with the Prices Commissioner's ruling that the maximum price for all dried beans (except Canadian Wonder, 40s.) shall be fixed at 35s. At this price, given reasonably favorable conditions, Navy beans should be profitable.

Fertilizer

The fertilizer ration available for these contract beans has been increased substantially. Superphosphate or basic superphosphate up to 3 cwt. per acre may be purchased, or up to 4 cwt. of 3 : 1 superphosphate and sulphate of ammonia mixture. The 3 : 1 mixture will not be necessary or available to growers in districts where root nodules develop naturally on this crop.

Root nodules have not developed on Navy beans to date in many Victorian districts, particularly where bean growing is a new industry. Much of the value of beans as a soil improver is lost if nodules do not form, and the Department has, therefore, decided to supply inoculum free to Navy bean growers for the treatment of about half their seed, so that this crop may be of maximum value as a soil improving crop in any well planned rotation.

Seed Requirements

Seed will be supplied to growers and, as in previous years, the price will not exceed the contract price for a comparable grade of beans. The cost of the seed will be deducted from crop returns.

Other varieties of beans with a shorter growing season than Californian Small White, the main crop, will be available for portion of the Victorian target area. The Department reserves the right to place the available seed to the best possible advantage; but, as far as possible, where growers express a desire to try one of the new varieties on part of their area their wishes will be met.

Harvesting Equipment

Harvesting equipment will be available for the harvesting of all areas of reasonable size and accessibility and where the surface is free from stones and fairly flat. The 1942-43 harvest has demonstrated that the new bean skimmers are thoroughly satisfactory and enable the crop to be harvested at a fraction of the cost of hand pulling. Machines for this purpose are now manufactured in Australia and growers may purchase them for about £35. It should be possible for growers to make arrangements to co-operate with neighbors in the purchase of a skimmer or to have this work done by contract, as was done in many cases last season.

Threshing of the crops may be performed for growers on contract and, where desired, arrangements for this will be made by the Department.

For areas of five acres and upwards on farms where weed growth is not excessive and weather is satisfactory and there is sufficient concentration of crops to justify a machine, a header harvester with a pick-up attachment can be provided for contract picking up and threshing of the crop from the windrows as left by the skimmers. Where the provision of a header harvester with pick-up would be at prohibitive cost, and impossible to arrange in time, a stationary threshing plant would be made available subsequently for the threshing of the grower's crop from the stack or the shed. This method may also be necessary and available for growers of under five acres. The grower would pay for this contract threshing, the prices being not above those charged in previous years, and it may be lower, owing to greater volume and better organization of the work.

Growers, who have not previously grown Navy beans, may obtain a copy of the pamphlet "Growing Field Beans in Victoria" and an application form for a contract to grow them, from the Department of Agriculture.

— — DON'T PASS ON RUMOURS — —

LIVE STOCK NOTES—*continued from page 497.*

are more resistant to disease than others, and such inherited vigor and vitality should be looked for in birds selected for breeding purposes.

Correct feeding is an important factor in the prevention of disease. Poultry will be more subject to disease if their rations are dificient in quantity and quality, or improperly balanced. A variety of foods is needed to maintain bodily health, and avoid monotony in the diet. Green food, free from fibre, is a necessity on every poultry farm. Not less than 5 to 6 lb. of chaffed green food should be fed to every 100 birds daily.

A comfortable environment for the birds is important also, if the percentage of eggs laid is to remain at a profitable level. Good birds, properly fed, and free from parasites, kept in clean, roomy houses, with clean perches and floor litter, will maintain a high standard of health and natural resistance to disease.

[H. F. Clinton, Poultry Expert.]

Bees

With small prospect of Eucalypt bloom in the western half of the State during the early summer months, beekeepers are faced with the problem of having to tide their bees over this period without losses due to starvation. No doubt migration by some apiarists to areas where conditions are more favorable, will help to provide a solution. Quite a number have already transferred their hives to parts of Gippsland where the White Stringybark is in bloom, and where prospects of clover bloom to follow, are good.

In cases where beekeeping is not a full time occupation, but is carried on as a side-line on the farm, transferring the bees for any great distance is out of the question, and feeding may be necessary.

On production of proof that it is necessary to feed bees, sugar can be obtained for the purpose from the Rationing Commission. A suitable syrup can be made by dissolving two parts of sugar in one of boiling water. Feeding should be done in the evening, immediately after sunset, to prevent possible loss by excited bees fighting and attempting to rob, as is usually the case when daylight feeding is practised.

[J. W. Thomlinson, Apiary Inspector.]

IN THE ORCHARD

By Officers of the Horticultural Division

Spraying Apples and Pears

THIS month, the codling moth will commence emerging from its winter quarters. Many apple and pear growers continue to suffer extensive losses of fruit damaged by this pest, and one frequently hears complaints that lead arsenate sprays are not effective in controlling the grub. This is not so, and no satisfactory substitute for lead arsenate is available. Many other factors, however, which are important in keeping the fruit clean, are often overlooked. For instance, how many growers can completely satisfy themselves that a thorough spraying job has been done ? The calyx spray, the foundation for successful control, is probably the most difficult to apply, and it is advisable to inspect the trees after spraying to see that every fruit has been well covered. For this spray a long rod is the most useful, and is preferred to the spray gun. The long rod enables the operator to direct the spray downwards into the calyx cup of the young upturned fruit. Lead arsenate will be of sufficient strength when used at the rate of 3 lb. of powder or 6 lb. of paste in 100 gallons of water. If it is necessary to combine this spray with lime sulphur for black spot on apples, add ½ lb. of lime casein spreader or 2 lb. of slaked lime, to the diluted lime sulphur before adding the lead arsenate. Do not use this spray during hot weather.

Subsequent sprays should be timed according to moth activity, and, at present, the best guide to periods during which large numbers of eggs are laid is provided by lures placed in the orchard. These consist of jars containing some liquid such as molasses, vinegar, apple juice, or waste wine, diluted in water. Many growers have installed these lures in some handy position in the orchard and inspect them regularly, sometimes every day, and thus are provided with reliable information as to the best time to spray. Lures maintained by the Department in each district are used to issue spray advice, and growers should make use of this service.

Where previous infestation in apples has been severe, the moth population will be large, and under these circumstances, it will be necessary to use a more efficient spray. The best cover spray will be one containing half a gallon of white oil emulsion combined with the lead arsenate. This spray is more adherent to the fruit than lead arsenate alone, and the oil will act as an ovicide. However, it should not be used on apples after December, because the arsenical deposit would be difficult to remove at harvest time.

Fruit Thinning

Apple trees are showing prospects of bearing heavy crops of fruit. In some cases, growers will have to consider thinning the fruit, possibly because of a heavy setting, or because of the difficulty in providing sufficient water, to bring the fruit up to size. Thinning a large crop will also make spraying easier, because it is difficult to thoroughly cover a bunch of five or six apples. In order that the benefit of thinning may be passed on to increasing the size of the following season's crop, it is advisable that it should be completed within thirty days of petal fall.

Lemon Storage

Many people grow lemons in the home or farm garden, and this year the size of the crop has been a source of much pride and pleasure. Several enquiries have been made concerning the best method for preserving the surplus crop. Lemons are most needed during the summer, when they are usually in short supply. Although at this time of the year some of the fruit is fairly advanced in maturity, there is still time to store some for future use.

Care in handling the lemons is one of the main points in ensuring successful storage. It is desirable that fruit should not be yellow ripe, but should be greenish-yellow in colour and from 2½ to 2¾ inches in diameter. Carefully pick the lemons so that the skin is not broken. The smallest puncture in the skin would permit fungous spores to enter and cause rots. The fruit should not be pulled off the tree, but the stalk should be cut so that a small button of the stalk remains on the fruit.

After picking, the fruit should be allowed to "sweat" for 10 to 14 days. This means that it is packed loosely in cases, so that some of the moisture will dry out of the rind. The lemons, then, should be packed carefully into boxes with clean, dry sawdust or chaff, or each lemon should be wrapped separately in paper. The object in treating the fruit in this way, is to slow down further evaporation, and by preventing close

contact of the fruit, the spread of disease is prevented. The cases should then be stacked away in some place where it is cool, dry, and not too draughty, i.e., in a cellar or under the house. Stored in this way, a supply of lemons should be available for the early summer months. Treatment of fruit with vaseline cannot be recommended, but certain wax emulsions have shown some promise, although these are likely to be in short supply until after the war. Stored lemons should be inspected once a month for any sign of mould development. This could be detected by the characteristic smell from lemons infected with blue or green mould.

Correctly stored fruit will be of excellent quality. The rind shrivels, so that the fruit will occupy about 25 per cent. of its former space, but the texture and juiciness of the flesh increase in quality.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

Phlox Drummondii

PHLOX Drummondii can be sown as soon as the frosts are over and the soil is warm. The seed may be difficult to obtain, but it is such a bright flower in the garden that it always repays the garden lover's efforts to procure it. A very large range of colours and profusion of blooms, carried in clusters, are its attractive characteristics. The effects are always pleasing, whether the plant is used as a massed bed or as a border. Being prostrate the large varieties of plants need some support if the seed is sown close to the edge of the beds. Without this support, sowings made near the edges of the beds encroach on the lawns and interfere with the cutting. Single colours, bicolour, and mixed varieties in very dwarf and dwarf sizes give a wide range from which to select. Phlox flower from early summer to late autumn, and enjoy the full sun.

The best results are obtained by sowing the seed in drills about 1 inch deep in the garden beds where the plants will remain. A light, rich loam will produce the best plants and blooms. After firming the seed, cover it with fine sandy loam to a depth of about ¼ inch and spread some old sieved manure along the drill to retain the moisture in the surface soil until the seed germinates. Plants should be thinned out later to 6 to 9 inches apart, and the plants removed can be used to fill up the spaces where germination has been poor. When lifting these plants remove a ball of soil with them. Transplanting is effected much more easily if some soil remains on the roots. If sowing is done later in the season, when the weather is hot and dry, shade the drill with strips of thick brown paper or light twiggy prunings until the seed germinates. For good germination use viable seed and keep the soil moist.

A number of strains and varieties is available—

Grendon Grandiflora, brilliant mixed colours, large bushy plants growing 12 to 15 inches high.

Cuspidata, has star shaped flowers in mixed colours and attains a height of about 1 foot.

Some of the separate colours in the Grandiflora strain are *Atropurpurea*—reddish purple; *Atrosanguinea*—crimson; *Brilliant*—rose with a darker eye; *Chamois Rose*—salmon rose with carmine eye; *Mars*—crimson with a white eye; *Stricta coerulea*—a blue shade.

The *Nana Compacta* type grow only 6 inches tall and are suitable for edgings and window boxes or in the rockery. *Dwarf Cecily grandiflora*, which is a little taller, can be used for the same purposes.

Petunia

The petunia derives its name from the Brazilian word for tobacco "petun," and it is closely related to the tobacco plant. Although it is a half-hardy, herbaceous perennial, in the southern districts of Victoria, the best results are obtained by treating it as an annual. It is a very useful plant to use in beds where pansies have just finished their season. If the soil is rich the *Giants of California*, with flowers 4 or 5 inches in diameter, should grow well, or *Ruffled Giants* could be used. This latter strain also has large flowers with beautifully ruffled petals and veined throats. In poorer soils the bedding varieties will be found more satisfactory. They grow to a height of from 9 to 15 inches, and usually provide a mass of bloom if planted in an open sunny position. *Rosy Morn*—rosy pink; and *Rose of Heaven*—a brilliant rose, are two popular varieties. *Snowball* is a pure white; *Periwinkle Blue*—a pastel blue; and *Violacea*—a deep violet.

The seed is very fine and similar in appearance to tobacco seed. Seed of the large-flowered types is scarce and expensive, but the bedding types seed more freely. Sow the seed in seed-boxes, and just cover with a very light layer of sandy loam. The seedlings should be ready for transplanting in 8 or 9 weeks.

When planting in the garden space the large-flowered types about 15 inches apart, and the bedding types about 12 inches. The large-flowered types will require applications of liquid manure every two or three weeks, but the bedding types should not be manured so heavily; in fact, much better effects will be obtained if the plants are grown under fairly hard conditions.

The expensive large-flowered varieties may be propagated by cuttings taken in autumn. The young plants, however, should be kept under cover in winter and placed out in the garden beds when frosts are over.

THE VEGETABLE GARDEN

Spinach

A sowing of round seeded (summer) spinach can be made early this month. This crop likes a rich soil and liberal amounts of a nitrogenous manure, such as blood manure, blood and bone, or smaller quantities of nitrate of soda, which is a more soluble and more concentrated fertilizer. If the latter is used at the rate of 1 oz. per square yard, the former types should be applied at the rate of 3 or 4 oz. per square yard. Spinach must be a dark-green colour and be grown quickly if the crop is to be a success. Details of the sowing of this crop were included in last month's notes.

Carrot

The best carrot crops are usually grown on land heavily manured for the previous crop, particularly a leafy crop like cabbages, cauliflowers, lettuce, or spinach. Lighter types of soil as a rule produce better roots than the heavier soils. In the heavy clays it is almost impossible to produce good carrots. Do not dig fresh stable manure into the beds in which it is intended to grow carrots. This material increases the forking of the roots. Dig the bed deeply and break up any soil lumps. Sow the seed thinly in drills 10 to 12 inches apart, depending on the variety. *Early Shorthorn* which is a small, quick-maturing carrot with a relatively small amount of top growth can be sown in drills 10 inches apart, while the larger varieties, like *Manchester Table* and *Danver's Half Long*, require the wider spacing—12 to 14 inches. After firming the seed cover it with $\frac{1}{2}$ inch of fine sandy soil and keep the drill moist until the seed germinates. As soon as the plants are large enough to handle, thin them out to about 3 inches apart. Watering and cultivation should be carefully attended to. Aphis may attack the young crop in the early summer. This pest can be controlled by spraying with nicotine sulphate 1 part in 600 parts of water. Add a very small amount of soft soap to increase the wetting properties of the spray. Dusting with one of the nicotine dusts will also be found effective. Other varieties of carrots which are popular at present are *Red Cored Chantenay*, *St. Valery*, and *Imperator*.

Parsnip

The parsnip requires much the same cultural treatment as the carrot, but it will grow better on the heavier soils. It also requires a wider spacing—about 12 to 15 inches between the rows and about 4 inches between the plants in the row. *Hollow Crown* is still one of the best varieties to sow.

Potato

Another planting of potatoes can be made this month. Choose one of the following varieties—*Up-to-Date* or *Carman No.* 3. Seed potatoes should be about $2\frac{1}{2}$ oz. in weight. Larger potatoes may be cut into 2, 3, or 4 parts, provided that each part has at least one good eye and weighs say not less than 2 oz. Plant the seed about 5 inches deep, with 2 feet between the rows and 15 inches between the plants. Before planting the potatoes dig into the beds a mixture of 6 parts of superphosphate and 1 part of sulphate of ammonia, at the rate of 3 oz. per square yard. If any horse manure or humus is available, this can be dug under also with the superphosphate and sulphate of ammonia.

Red Beet

To prepare the soil for Red Beet, apply about 6 oz. per square yard of agricultural lime and dig the bed thoroughly. Allow the soil to settle for a few weeks, or if it is a very light soil tramp it down to consolidate it. Sow the seed in drills about 12 to 15 inches apart, firm the seed in the drills by gentle pressure, and cover with sandy soil to a depth of about $\frac{3}{4}$ inch. When the plants are large enough to handle, thin them to about 4 inches apart. Varieties suitable for the home garden are *Crimson Globe*, *Detroit Dark Red*, and *Derwent Globe*.

Beans

Dwarf French beans as well as climbing beans can be sown this month. Climbing beans should not be sown until the end of this month, or early November. Suitable varieties of French beans are *Brown Beauty* and *Emperor William*. Space the rows about 2 feet apart with 4 to 6 inches between the seeds which should be about 1½ inches deep. When preparing the beds dig in 2 or 3 oz. per square yard of blood and bone manure and any well-decayed organic matter.

Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hospital	Ballarat	66	Northcote Children's Farm	Bacchus Marsh	156
Ballarat Orphanage	Ballarat	135	Onley, W. H.	"Glenholme," Caldermeade	55
Banyule Stud Pty. Ltd.	Wangaratta	31	Payne, A. E. T.	"Yarra View," Lilydale	63
Black, I. S., Estate	Mount Noorat	53	Payne, T. E. N.	"Woodburn," Kilmore	46
Clarke, A. B.	Glenormiston South	15	Poole, M. A. and D.	Caldermeade	134
Dennis, Mrs. A. A.	Frankston	42	Poole, M. A. and D.	Yannathan	72
Dookie Agricultural College	Dookie	85	Powell, T. S.	"Carellen," Mansfield	46
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Geelong Grammar School	Corio	68	Samuel, Misses G. and E.	Lang Lang	48
Gibson, Mrs. C. S.	"Sweeney's," Eltham	35	School of Horticulture	Burnley	10
Gorman, A. W.	"Cathcart," Alexandra	57	State Experiment Farm	Rutherglen	40
Hollaway, R. W.	Caldermeade	75	State Research Farm	Werribee	229
Kilmany Park Farm Home for Boys	Sale	104	Tanner, N. J.	Pakenham	33
Lawrence, P. H.	"Rainga," Tarrawarra	72	Vagg, T. E.	Officedale	45
Longerenong Agricultural College	Dooen	43	Wells, W. G.	Caldermeade	63
McNabb and Son, G. A.	Irrewillipe East	154			

In addition to the above-mentioned herds there are 242 commercial dairy herds containing 9,248 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 782 herds in which 14,782 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

ERRATA

In the article "Pig Production Survey" published in the August issue of the Journal, the following passage occurs on page 382, column 1 :—"Table 2 shows that there was a total increase of 193 sows or 7·1 per cent. . . . . ." This should read "293 sows or 10·9 per cent.. . . . . ." In the same article on page 383, column 1, second paragraph, the figures "7·1 per cent." should read "10·9 per cent.".

School of Dairy Technology *and* Dairy Research Institute

Report for Year ended 30th June, 1943

By T. M. JENSEN, B.Agr.Sc.,(N.Z.), Principal and Chief Dairy Research Officer

THE Victorian School of Dairy Technology, and the associated Dairy Research Institute, were established by the Department of Agriculture in 1939 with the object of providing a State centre for instruction and research in dairy technology. The functions of the combined institutions, embrace the teaching of dairy technology to dairy factory operatives, the provision of laboratory service to the dairy manufacturing industry, and research into dairying problems of a local nature. Work performed during the year ended 30th June, 1943, is briefly reviewed in the following statement.

INSTRUCTION IN DAIRY TECHNOLOGY

In our last annual report, it was pointed out that owing to the disturbed conditions created by the war, the normal course of instruction in dairy manufacture had temporarily to be abandoned, attention being devoted instead to special short courses in milk and cream testing, buttermaking, and cheesemaking. A similar policy was continued during the year at present under review and, to judge from the number of enrolments, s still proving popular with trainees.

LABORATORY SERVICE AND CONTROL WORK

As in previous years, a wide variety of chemical and bacteriological examinations has been made on samples of milk, cream, butter, cheese, water, dairy factory requisities, &c., submitted for analysis. Reports on these examinations and recommendations arising therefrom, have already been furnished to the various bodies concerned, but a few points of general interest arising from this work, are worthy of further mention :—

(a) Bacteriological Examinations on Factory Butter

Bacteriological counts on samples of factory butter drawn at the Melbourne grading floors were made throughout the season to provide an index of the state of sanitation existing in various plants. To assist buttermakers to interpret the counts, it has been customary to employ a scheme of classification which divides the counts into various arbitrary classes corresponding with different standards of sanitation in the factory. During the season under review, a revised scheme of classification was adopted which differs from the previous one in the manner indicated below :—

BACTERIA PER CUBIC CENTIMETRE OF BUTTER.

Old Scheme.		New Scheme.	
Class A	0–5,000	Class A (good) ..	0–10,000
Class B	5,000–25,000	Class B (fair) ..	10,000–35,000
Class C	Over 25,000	Class C (poor) ..	35,000–75,000
		Class D (bad) ..	Over 75,000

(b) Acidity of Factory Butter Samples

Routine pH determinations on samples of export butter drawn at the grading floors over the year have been examined for pH value to reveal the present trend in cream neutralization practice in butter factories. The results are summarized in the following Table :—

pH Range.	Number of Samples.	Percentage of Total.
		%
Below 6·2	1	0·9
6·21–6·4	4	3·7
6·41–6·6	5	4·7
6·61–6·8	7	6·5
6·81–7·0	11	10·3
7·01–7·2	30	28·0
7·21–7·4	32	29·9
7·41–7·6	14	13·1
7·61–7·8	11	10·3
7·81–8·0	2	1·9
	107	

Mean pH .. .. = 7·17
Maximum pH .. .. = 8·0
Minimum pH .. .. = 5·3

Almost 90 per cent. of the samples are covered by the pH range from 6·8 to 7·6, while over 60 per cent. fall within the range 7·0 to 7·4. Values outside the limits 6·8 to 7·6 are considered to be due to faulty work in the factories rather than design, because the brands which gave the extreme values also gave erratic results from one sample to the next.

(c) Starter Cultures for Cheese and Casein Manufacture

A monthly supply of starter cultures has again been provided to cheese and casein companies subscribing to the Department's Starter Service. Cultures have also been sent, on request, to destinations outside the State.

In the case of cheese manufacturers, the demand continues to be for cultures of the mixed-strain type rather than for selected single-strain cultures. This is in distinct contrast to recent practice in other large cheese-producing countries where the trend is towards the use of a small percentage (one per cent. or even less) of an active single-strain culture in the cheese vat.

The special facilities necessary for the maintenance of single-strain starters at cheese-factories, have been described in a Bulletin on starter maintenance recently issued by this Institute. Although the same facilities are of advantage also in the propagation of mixed-strain cultures, it is a fact that the latter can be propagated more or less successfully under more primitive conditions. For this reason they may remain more popular with cheese manufacturers, at least for the duration of the war. The special casein cultures described in last year's report have continued to prove satisfactory to casein manufacturers.

(d) Tests on Factory Brine Samples and Boiler-Feed Waters

With the increasing difficulty of obtaining plant replacements, dairy companies are showing greater interest in prolonging the life of their equipment by careful maintenance methods. An important factor in this connexion, is the corrosiveness of refrigerator brine for metal equipment such as coolers, vat coils, &c., with which it comes in contact. As the corrosiveness of brine is closely related to its density, acidity, and ammonia content, some factories are now submitting samples of brine to be tested for these properties.

Another novel feature in the laboratory service work is the testing of boiler-feed waters for odoriferous substances likely to impart taints to the butter where direct-steam pasteurization of cream is practiced.

RESEARCH WORK

Research work carried out during the year has been partly a continuation of work in progress in the previous year, but attention has also been devoted to a number of new projects.

The various studies comprised :—

(*a*) an investigation of the practices in vogue in this and other countries for the development of flavour in butter.

(*b*) the effect of S. Lactis var. Maltigenes on the flavour of cheese and butter.

(*c*) an investigation of the composition and characteristics of cleaning compounds in use in dairy factories for the cleaning of dairy equipment.

(*d*) the quality of boiler-feed waters used in butter factories with reference to their suitability for the generation of steam for the direct-steam pasteurization of cream.

(*e*) the use of the oval-tube technique for routine bacterial counts on butter.

(*f*) further work on the detection of "rabbito" organisms in butter.

(*g*) further work on the origin of bacteriophages for the lactic streptococci used in cheese starters.

(*h*) a survey of the practice of non-stripping cows after machine milking.

In addition, work has been commenced on the following projects :—

(i) the practicability of using glass pipes in milking machines.

(ii) the application of the coliform test as an index of milking machine sanitation.

(iii) the use of a new indicator in a reductase test for the hygienic quality of milk.

(iv) the application of the phosphatase test to cream pasteurized by the Flash method.

A summary of results achieved during the year on the respective research projects, is given in the following statement :—

(a) Butter Flavour

(T. M. Jensen, and A. G. Itzerott.)

Without entering into the question of the relative merits of mild- versus full-flavoured butter from the standpoint of consumer preference, and without attempting to clarify legal aspects of adding butter-flavour concentrates to butter, it was felt desirable to obtain comparative data on the various practices adopted in Victoria and elsewhere for intensifying the flavour of butter.

The practices studied were :—

(1) the ripening, or souring of fresh (sweet) raw cream prior to processing, by holding for approximately 24 hours at temperatures suitable to the development of acidity.

(2) addition of about 0·5 per cent. of starter culture to cold pasteurized cream and holding overnight at temperatures sufficiently low to prevent development of acidity prior to churning.

(3) addition of small amounts of pure diacetyl to butter at the salting stage.

(4) addition of small amounts of starter distillate to butter at the salting stage.

In the case of (1), we were fortunate in having before us the results of what was virtually a large-scale experiment carried out under commercial conditions by a local butter company. This company was handling sweet, factory-separated cream, and found that the resulting mild-flavoured butter did not suit the taste of the Australian grader. It thereupon resorted to a cream-ripening process whereby the fresh, raw cream was held overnight in insulated vats at a temperature suitable to the development of acidity. No starter culture was used to assist in the acidification of the cream. On the following day, the cream was neutralized and pasteurized and held overnight at the churning temperature prior to churning. This resulted in a fuller-flavoured butter comparable with that made from good quality, farm-soured cream, and since the introduction of this practice, the company has continued to maintain one of the highest grading averages in Australia. Attempts by other factories handling sweet cream to adopt the same process, have not been successful in all instances owing no doubt to an undesirable type of flora arising in the cream during the acidification process. In this connexion, results of experiments resorted under (*b*) below, appear to be of considerable significance.

Methods (2), (3), and (4) are used in other countries for brightening the flavour of sweet-cream butter, their beneficial effects in this respect having been well established. In the present study, it was decided to investigate and compare their effects on typical Australian sour-cream butter. To study the effect of (2), split batches of sour cream were neutralized and Vacreated in the same manner and held overnight under similar conditions, except that 0·5 per cent. of starter (either mixed- or single-strain culture) was added to one vat prior to holding. The churning temperature at which the creams were held, was always low enough to prevent any significant increase of acidity in the inoculated vat prior to churning. Both vats were churned and manufactured in the same fashion. The resulting butters were graded at an age of four days, and again after three months storage at 14° F. The results are given in Table A.

TABLE A.—STARTER SERIES.

Expt. No.	Churning.	Grade at Four Days.	Grade at Three Months.
1	Control ..	93	91 stalish.
	Starter ..	93 more flavour.	91 stalish.
2	Control ..	93	92 aged flavour
	Starter ..	93 brighter flavour.	92½
3	Control ..	93	92 slight aged flavour.
	Starter ..	93	92 slight aged flavour.
4	Control ..	94	93 weaker.
	Starter ..	94 better flavour.	93
5	Control ..	94	92½
	Starter ..	94 full flavour.	92½
6	Control ..	93	91½
	Starter ..	93	91½
7	Control ..	93	91 metallic.
	Starter ..	93 best flavour.	92
8	Control ..	93½	93 weakest.
	Starter ..	93½	93
9	Control ..	93	91
	Starter ..	93 slightly brighter flavour.	92
10	Control ..	93	92 stalish.
	Starter ..	93	91½ stalish.

Methods (3) and (4) were compared by adding carefully graded quantities of diacetyl and of a starter distillate of our own preparation, to butters manufactured from sour neutralized creams. In each experiment, three churnings were made from the same vat of cream, one churning being used as a control, one being flavoured with pure diacetyl, and the third with starter distillate. The amounts of pure diacetyl and starter distillate used in each experiment were equivalent on a diacetyl basis. The results are given in Table B.

TABLE B.—DIACETYL AND STARTER DISTILLATE SERIES.

Expt. No.	Churning.	Final Diacetyl Content of Butter.	Grade at Four Days.		Grade after Three Months at 14° F.
			Grader A.	Grader B.	
1	Control ..	0·2 ppm. (approx.)	94	94	93
	Diacetyl	0·3 ppm. (approx.)	94	94	93 (—)
	Starter distillate	0·3 ppm. (approx.)	94	94	94
2	Control ..	Not done	92	94	93
	Diacetyl	Not done	93	94	93 (—)
	Starter distillate	Not done	93	94	93
3	Control ..	Not done	93	..	93 (—)
	Diacetyl	Not done	93	..	93 (—)
	Starter distillate	Not done	93	..	93 (—)
4	Control ..	·05 ppm.	94	..	93
	Diacetyl	0·33 ppm.	94	..	93
	Starter distillate	0·30 ppm.	94	..	93
5	Control ..	..	..	93	93 (—)
	Diacetyl	0·37 ppm.	..	94	93
	Starter distillate	0·35 ppm.	..	94	93
6	Control ..	0·25 ppm.	93	93	93
	Diacetyl	0·7 ppm.	93	94	93
	Starter distillate	0·8 ppm.	93	94	93
7	Control ..	0·2 ppm.	93	..	93
	Diacetyl	1·0 ppm.	93	..	93
	Starter distillate	0·8 ppm.	93	..	93

The conclusions drawn from the investgation were :—

1. Souring of sweet cream in the factory, prior to processing, has proved a satisfactory method in some factories for intensifying the flavour of sweet-cream butter to a degree equalling, but not exceeding, that of butter made from good quality, farm-soured cream. Compared with methods (3) and (4) it is cumbersome, costly, and likely to give variable results in different localities.

2. It was found that the flavour of butter made from sour-cream could be intensified and made more attractive to the grader, by the addition of a half per cent. of starter to the cold pasteurized cream prior to holding overnight at the churning temperature. Although the starter butters maintained their quality during storage quite as well as the control butters, it should be pointed out that serious damage to the keeping quality of the butter is likely to result from this practice if impure cultures are used, or if acid is allowed to develop in the pasteurized cream owing to improper control of the holding temperature.

3. The flavour of sour-cream butter can also be intensified without damage to the keeping quality of the butter, by the addition of small amounts of either pure diacetyl or starter distillate. However, in the present experiments, such additions did not always result in a higher score than that awarded to the control butters. The flavour produced by either pure diacetyl or starter distillate was rather different in character from that of the starter butters of Series 2, most judges prefering the latter. Slight differences in flavour were also noticeable immediately after manufacture between butters flavoured with pure diacetyl and those flavoured with starter distillate but no distinction was drawn between these butters by grading officials.

(b) The Effect of S. Lactis Maltigenes on the Flavour of Butter and Cheese

(T. M. JENSEN.)

In isolating strains of lactic streptococci from soured milk samples it was noticed that many of the strains isolated from local milks, possessed the property of giving a distinct, malty, or caramel flavour, when grown in milk. (The name of *S. Lactis* var. Maltigenes, was given by the American workers, Hammer and Baker, to strains possessing this characteristic.) Later, during investigations into cream quality trouble in certain districts in Victoria, the organism was isolated repeatedly from cream supplies. Owing to the apparent widespread occurrence of the organism in these districts, it was decided to investigate its influence on the quality of cheese and butter.

A small vat of cheese-milk inoculated with the organism immediately prior to manufacture, gave a pronounced malty smell and flavour which became stronger as the manufacture proceeded, the smell eventually pervading the whole factory atmosphere. The resulting cheese had an extremely sickly, unclean flavour which became more objectionable as the cheese aged. Cheese from an uninoculated control vat was quite normal.

An experimental vat of cream of low acidity, was inoculated with the organism and then held overnight at about 70° F. On the following morning the cream had a distinctly unclean flavour and smell. A control vat inoculated

with a non-malty strain of *S. Lactis*, remained normal. After neutralization and Vacreation at 200° F., the flavour of the cream inoculated with *S. Lactis* Maltigenes was, if anything, stronger than before, showing that the taint had not been removed or reduced in the Vacreation process. The flavour of the resulting butter was distinctly unclean and graded 91 points, as compared with 93 points for the control butter.

(c) Characteristics of Cleaning Compounds used in Dairy Factories

(A. G. Itzerott, R. H. Trembath, and T. M. Jensen.)

Following along the lines of a similar investigation recently made in New Zealand, attention has been devoted to the composition of cleaners in use in Victorian dairy factories. Samples, representative of the different cleaners in use, were obtained from the factories for analysis and information was collected regarding the particular uses to which the different types of cleaner were being put.

In keeping with the New Zealand findings, it was found that the majority of cleaners analysed consisted either of single raw alkalis such as caustic soda, sodium carbonate, sodium metasilicate, trisodium phosphate, or of mixtures of two or more of these alkalis in various proportions. Some of the cleaners also contained soap, or a special wetting agent. The cost of the proprietary mixtures relative to the cost of the raw ingredients was in some instances quite reasonable, but in others, altogether excessive. A few examples are given in the following Table :—

Cleaner	Type.	Estimated Cost of Ingredients per ton.	Price of mixture per ton.
A	Caustic soda, sodium carbonate mixture	£25	£50
B	Sodium carbonate, sodium metasilicate, trisodium phosphate mixture	£25	£27
C	Phosphoric acid solution	11s. 6d. per gallon	32s. 6d. per gallon

The purposes for which the different types of cleaners were being used may be briefly summarized as follows :—

Soda ash appeared to be used extensively as a general cleaning agent, and almost exclusively, for the washing of milk and cream cans, and wooden churns. For the former purpose, the commonest strength of solution appeared to be about 0·2 per cent., and for churn washing about 0·1 per cent. Some factories continue to purchase their sodium carbonate in the form of washing soda crystals, instead of the more economical soda ash form.

Mixed cleaners were also in fairly general use for the cleaning of all types of metal equipment. Mixtures containing sodium metasilicate or trisodium phosphate in addition to soda ash, have been found to have better grease-removing and protein-dissolving power than soda ash alone, and have also been found less inclined to give a residual film on equipment when used with hard water. In some instances, factories were found reverting to the use of straight sodium metasilicate for general cleaning purposes, the users being apparently unaware that equally good results can usually be obtained at less cost by the use of the metasilicate in mixture with a considerable proportion of cheaper soda ash.

Special cleaners containing a high proportion of silicate were in general use for the cleaning of aluminium equipment such as metal churns, and strongly caustic mixtures consisting of approximately 50 per cent. caustic soda and 50 per cent. soda ash were in use in some factories for the cleaning of stainless steel pasteurizers. Apart from this, there seemed to be little conscious attempt to select the type of cleaner in accordance with the kind of cleaning job in hand, or the characteristics of the water supply. Most users were unaware of the composition of the mixtures they were using and there was no attempt to effect economies by making up the desired mixtures in the form of stock solutions from the raw alkalis.

(d) Quality of Boiler-Feed Water for Direct-Steam Pasteurization of Cream

(T. M. Jensen.)

A peculiar foreign flavour in the butter of several commercial factories, was traced to the presence of odoriferous substances in the boiler-feed water used for generating steam for the direct-steam pasteurization of cream. Filtration of the water after treatment with alum or activated carbon, removed the odoriferous principle.

(e) Oval-Tube Technique for Routine Bacterial Counts on Butter

(W. C. T. Major.)

The oval-tube technique developed by Myers and Pence, (J. Milk Tech. Vol. 4, No. 1.), for use with pasteurized milk, has been adapted for

making routine bacterial counts on butter. The tubes in use give about 18 sq. cms. media surface. Platinum wire loops, standardized to transfer ·005 and ·001 grams of melted butter at a temperature of 42°C., are used to inoculate two tubes from each sample of butter. Tubes containing up to 140 colonies are suitable for counting. Data are being obtained to compare the accuracy of the method with that of the plate count.

(f) Detection of Surface Taint Organisms in Butter

(W. G. Crewther.)

Organisms isolated from butter, by the technique described in last year's report for detecting surface taint organisms in water supplies, have been compared with strains isolated from water in respect of cultural and biochemical characteristics and effect on butter. It was found that the strains isolated from butter corresponded closely in characteristics with those isolated from water.

(g) Origin of Bacteriophages for Lactic Streptococci used in Cheese Starters

(T. M. Jensen.)

Following on the observation reported last year, that bacteriophage had been found in filtrates from milk cultures of certain strains of lactic streptococci to which rennet had been added at the time of inoculation, further work has been devoted to determine whether the phage is introduced to the culture as a contaminant with the rennet, or whether it is released from the streptococci themselves when the latter are grown in milk containing rennet. After several different approaches had been made to a method of settling this point, direct evidence that the phage was released from the streptococci was obtained in the following manner :—

A strain S, which had been tested on more than 150 occasions with the same batch of rennet extract without yielding a phage in the filtrate, was acted upon in milk culture with a phage (P) which gave strong lysis. The resistant secondary culture, which developed after a few days, was subcultured in milk for several days and then purified by plating. After subculturing for several more days during which filtrates from ordinary milk cultures were tested with negative results for phage active against the parent strain S, or the secondary strain S_2, the secondary culture was grown in milk containing some of the same rennet extract as previously used. The filtrate from this culture yielded a phage (P_2) which attacked both the secondary culture S_2 and the parent strain S. Strain S_2 remained resistant, however, to the action of phage (P).

The conclusions drawn were that the phage (P_2) was "carried" in an inactive state in the strain S_2 which developed from the lysis of strain S. When S_2 was grown in milk containing rennet, the phage P_2 was released in an active state. Phage (P_2) differed from phage (P) in that it attacked S_2 whereas (P) did not. Phage (P_2) could not have been present in the rennet from the outset or it should have lysed strain S, which was also susceptible. It therefore appears that some strains of lactic streptococci may act as "carriers" of phage and may release phage when grown in the cheese vat.

(h) A Survey of the Practice of Non-Stripping Cows after Machine Milking

(T. M. Jensen, and D. Wishart*.)

Visits were made to a number of farms for the purpose of studying the effects of non-stripping after machine milking, on the production and health of the cows. With the assistance of the Dairy Supervision Branch, expressions of opinion on the effect of the practice were also obtained from a number of other farms, thus bringing the total number of farms involved to over thirty. The period for which non-stripping had been practiced on these farms, varied from several months to several years. Some owners had resorted to the practice only with heifers, while others, had changed the whole herd over to the practice without difficulty. In some herds, a few cows which had not responded well to the practice were being hand-stripped while the remainder of the herd was not stripped.

Only one owner expressed himself as dissatisfied with the practice because of reduced production, and it may or may not have been coincidence that this was the only farm visited which had a vacuum-break device fitted to the milking machine. In no instance was an increase in udder troubles considered to have resulted from the abandonment of stripping. On the contrary, some owners contended that udder troubles had decreased since stripping had been abandoned.

Owing to a lack of official production and culling records, no documentary evidence could be obtained to support the various claims made.

* A veterinary officer of the Live Stock Division.

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Number of Birds.
Abernethy, F. J. L., Horsham	445
Abikhair and Tracey, Heidelberg	595
Aitken, J., Silver-street, Cheltenham	900
Archard, K. F., Yeoburn East	126
Armstrong, D. M., Campbell's Creek	178
Bantick, H. M., Heatherton	276
Barber, Mrs. M. E., Lower Ferntree Gully	109
Barnes, A., Blackburn	1,972
Bartlett, E., Pimpinio	273
Bassett, R. A., South Muckleford	135
Batey, R. F., Invergordon S.	802
Becker, F. W., Cheltenham	293
Belsar, Mrs. H., Barongarook	82
Bentley, F. W., Frankston	592
Berry, R., Campbell's Creek	57
Bethell, R. A. B., Lower Templestowe	745
Bingley, A., 333 Highbury-road, Burwood, E.13	169
Blyth Bros., Bayswater	97
Cakebread, H., Shady Creek, via Warragul	225
Clark, H. N., Croydon	2,011
Clarke, F. W., Stonehaven, via Geelong	82
Clegg, R. M., Hamilton	31
Coats, C. J., Donald	63
Coles, W. R., Croydon	79
Counsel, A., Wantirna	248
Coupar, J. E., Nathalia	458
Cox, F. S., and C. P. West, Cheltenham	223
Davidson, Mrs. W., Ringwood	103
Davis, Wm., New Gisborne	28
Dawson, L. J., Eversley	110
Dawson, Mrs. D. M., Castlemaine	384
Dimoline, W., Noble Park	358
Donald, Alex., New Gisborne	405
Dookie Agricultural College, Dookie	614
Eastaugh, T. L., Highett	448
Eastman, L. H., Pascoe Vale	764
Emmett, J. T., Verdon-street, Inglewood	34
Evans, Mrs. R., Kyneton	101
Everard, H., Hawkesdale	382
Forbes, J. B., Bulga	233
Fry, J. L., Alphington	166
Gartner, Miss M. T., Box Hill	119
Gillespie, Messrs. E. J. and C., Main-road, Wesburn	223
Giovanetti, R. M., Kennington, Bendigo	24
Godfrey, Mrs. M. A., Healesville	271
Grant, D., 6 Laurel-grove, Blackburn	63
Greenshields, E. J., Lancefield	221
Greenwood, James, Forest Hill	191
Gregson, R., Ky Valley	272
Grenville, G. W., Spring Vale South	2,180
Gwyther, R. P., Highton	294
Hall, R. H., Wal Wal	342
Hamilton, A., Flinders	995
Hayes, R., Montrose	143
Hazael, Geo. P.	15
Heath, A. L., Westall-road, Springvale	301
Hemphill, A. E., Monegetta	441
Henderson, C. W., Shepparton East	367
Hill, A. E., Balwyn	76
Hines Bros., Traynor's Lagoon	1,300
Hockley, N., Hamilton	48
Hopkins, C. A., Shepparton	1,260
Holdsworth, A. W., Jung	828
Horsfall, J. B., Lower Templestowe	825
Hunt, R. R., Burwood	462
Jackson, C. and H., Carrum Downs	140
Johnson, A. S., Lower Ferntree Gully	853
Jolly, W., Five Ways P.O.	249
Jones, M. A., Ringwood	362
Kenneally, Wm., Hampton Park, via Dandenong	170
Kidgell, L. L., Ringwood	331
King, J. J., New Gisborne	48
Kosch, E. W., Coromby	389
Kostos, D., Oakleigh	769
Lamble, F., Fussel-road, Kilsyth	196
Lennie, Mrs. J. E., Mt. Scobie, via Kyabram	88
Longerenong Agricultural College, Dooen	381
Lowe, L. S., Bayswater	175
Lucas, Geo., Blackburn	377
McCabe, R., Dandenong	1,447
McDonald, Mrs. E. M., 114 Barkly-street, Ararat	106
McDonald, R. A., Moyston	114
McKay, D., Pascoe Vale	750
Mackintosh, W. C., Neerim South	639
McLaughlin, K. A., Bayswater	730
McLeod, Miss K. M., Digger's Rest	196
McNamara, Owen J., Ringwood	846
Maher, A. E., Wal Wal	987
Mair, W. P., Tyabb	91
Major, W. R., Girgarre	75
Massie, G., Shepparton	1,402
Mead, J. L., Oakleigh	81
Meaklim, R., Mooroopna	89
Miceli, Mrs. G., Monbulk, P.O.	130
Molson, W. E., Blackburn	599
Moore, H. A., Ringwood North	321
Mulconry, H., Noble Park	70
Mumford, L. J., Healesville	395
Mynott, J. B., Eltham	25
Nemet, P., Springvale	797
Newparth, F. C., Croydon North	104
Nichols, Mrs. E. M., Yan Yean	481
Nichols, W. G., Wandong	115
Osborne, Mrs. M., Katandra West, Tallygaroopna	451
Pearse, Mrs. H. F., Donald	279
Peel, C. W., Gnarwarre	360
Penn, Mrs. C., Beaumaris	527
Poole, A. T., Mooroolbark	319
Poulton, A. W., Sebastopol	255
Purser, E. T., Everard-road, Ringwood East	690
Rae, John, Sebastopol	1,736
Reformatory Prison, Castlemaine	299
Ridge and Son, Blackburn	682
Ridgway, G., Noble Park	143
Robinson, Mrs. M. S., 42 Watt-street, Box Hill, E.11	32
Rogers, S., Dandenong	883
Rushton, J. A., Shepparton	772
Salathiel, C. P., Bendigo	514
San Miguel, Mrs. M. H., Box Hill	2,317
Sanders, A., Wantirna	367
Shipp, R., P.B., Kerang	454
Simpson, G. D., Glen Waverley	695
Skinner, Miss M. F., Noble Park	81
Smith, E., Highton	211
State Research Farm, Werribee	371
Stephenson, Mrs. K., Research	311
Stewart, J. A., Castlemaine	653
Stiles Bros., Wallan	795
Sutherland, J. M., Box Hill	899
Sweeney, J., Ararat	238
Taylor, E. D., Sebastopol	2,002
Thomas, C. H., Burwood	219
Throup, N. C., Neerim South	31
Throup, R. E., Neerim South	199
Trinca, M., East Oakleigh	1,328
U'Ren, B. W., Mt. Waverley	128
Vogt, E. G., Mentone	165
Waldmann, F., North Balwyn, E.9	1,147
Walker, Mrs. E. H., Lancefield	126
Webb, A. E. H., Cranbourne	2,306
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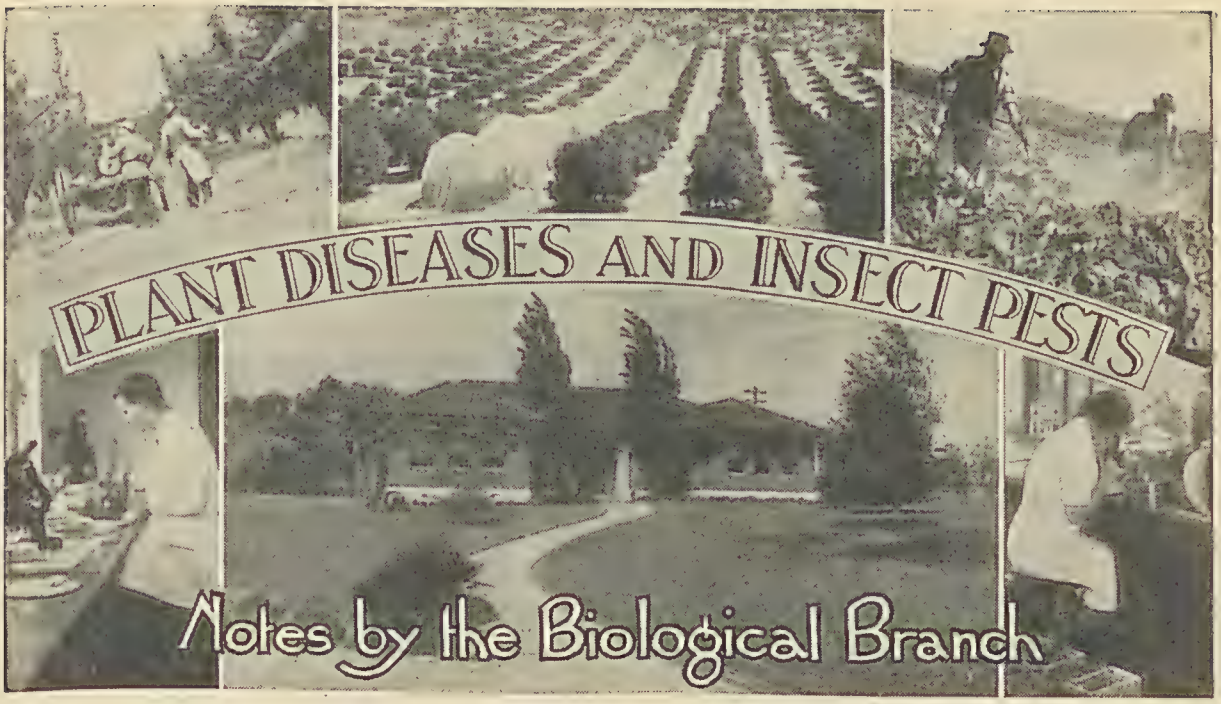


EELWORM SCAB OF POTATOES

Considerable damage to potatoes may be caused by the Eelworm, *Heterodera marioni*. Affected tubers are easily detected by the presence of nodular or wart-like swellings on their surfaces. Often these swellings are few in number, but in severe cases the entire surface of the tuber may be covered.

The female worms, which cause these swellings, are found in clear areas, embedded in the tissues of infected tubers when cut across.

The effect of eelworm attack on those portions of the plant above the ground, may be very slight. Sometimes the plants are slightly stunted, but under other conditions, although the tubers may be heavily infested, the plant may appear normal.

Potato plants may become infected by growing them on an area already infected with eelworms, or by the introduction of eelworms into the area in "seed." Eggs and larvae of the worm may survive in the soil for a period of up to two years. Owing, however, to the large number of different species of plant attacked by the worm, it is probable that unless proper steps are taken to control it, the worm will remain indefinitely in any infested area, because of the fact that many common weeds act as hosts for the worm and ensure its carry-over from season to season.

Control Measures

Rotation.—Serious attacks of eelworm have often followed the practice of growing potatoes continuously on the one area. In addition, eelworms often cause severe losses in potatoes following pasture, as many pasture plants are hosts for the eelworm.

Tuber affected with eelworm, showing typical wart-like appearance.

Severely infected tomato seedlings, showing collar rot and leaf spotting.

Crops known to be immune from attack by eelworm should be grown in rotation with potatoes. Most varieties of rye, wheat, and oats are resistant to attack, and it has been observed that, under Victorian conditions, a rotation in which an oat crop is incorporated with potatoes, particularly as a green field crop, gives satisfactory control of eelworms.

Seed Selection.—Growers should take every precaution to ensure against the introduction of the pest into clean areas by means of infected seed. All seed showing the characteristic wart-like swellings typical of eelworm attack, should be discarded for seed purposes and only clean seed should be used for planting.

TARGET SPOT—OR EARLY BLIGHT OF TOMATOES

The disease known as Target Spot or Early Blight, occurs practically everywhere in Victoria where tomatoes are grown. The fungal parasite (*Alternaria solani*) is capable, also, of causing a disease of the same name to potatoes.

The disease has been named Target Spot because of the occurrence on the leaves and stems of infected plants of dark-brown target-like spots. All parts of the tomato plant above ground, including the fruit, may be attacked by the fungus. The disease is particularly important in the seed-bed where it may cause a serious seedling blight. This phase of the disease may assume epidemic proportions in commercial nurseries where early tomatoes are raised in heated glass-houses.

Target Spot has been serious in several commercial nurseries this season and from evidence available at the present time, it seems likely that the disease originated in the seed.

The disease first appears on the cotyledonary leaves of the seedlings (as illustrated) and the parasite attacks the true leaves as they are formed, producing numerous small, irregular, black or brown spots which eventually enlarge into the characteristic target-like areas. The lower leaves which are the first to be attacked, turn yellow, wither and die, and the seedling is eventually defoliated except for the top rosette of leaves. Susceptible varieties may develop a collar rot which results in the total collapse of the seedlings.

Starved plants are more susceptible to attack by this fungus than vigorously growing plants. This is particularly noticeable in seedlings which have been allowed to remain too long in seed-boxes or seed-beds before transplanting. The seedlings will usually outgrow the disease if they are stimulated in the early stages of disease development with a nitrogenous fertilizer.

The disease is rarely serious in the field in the principal tomato growing districts of this State and its presence usually indicates inadequate manuring, with a resultant lack of vigour and increased susceptibility to the fungus.

Tomato seedlings grown from infected seed.

Fungal development is most rapid when atmospheric humidity is high and air temperatures range between 75 and 85° F. Thus, early and late tomatoes are most subject to attack owing to more favorable conditions for the growth of the parasite.

Spores of the fungus also, may gain entry into the fruit through wounds such as growth cracks, stem scars or insect punctures. The humid conditions which develop in transit or in storage enable the fungus to develop causing the fruit to decay. This fruit-rot can usually be identified by the presence of a brownish-black mould growth which is produced over the surface of the fruit.

Heavy losses are sometimes caused by the fungus in out-of-season tomatoes imported from South Australia and Western Australia, and held in the warm humid atmospheres of ripening rooms before being marketed. Such fruit usually shows no sign of decay when it arrives at its destination.

Control

Only firm healthy fruit should be selected for seed purposes.

On no account should old tomato soil be used for seed-beds. Virgin soil should be obtained for seed-beds whenever possible.

At the first appearance of the disease in the seed-beds, the plants should be sprayed with copper oxychloride at the rate of 1 oz. to 3 gallons of water or with 3 : 3 : 40 Bordeaux mixture. Bordeaux mixture may cause injury unless the heavy spray droplets which collect on the young topmost leaves are dislodged by a water spray applied in the form of a fine mist immediately after the Bordeaux application. Two or three applications of either copper oxychloride or Bordeaux mixture will be required in the seed-bed. The last spray of Bordeaux mixture should be applied at least five days before setting the plants in the field.

Where it is necessary to protect tomato plants in the field against infection, a 7 per cent. copper dust should be used in preference to Bordeaux mixture which may decrease yield.

BLACK PIT OF CITRUS

Black pit is a disease which attacks citrus trees in all the major citrus growing areas of the world. In Victoria it periodically develops to economic proportions and has been particularly common this season.

The disease which is caused by the bacterial organism (*Phytomonas syringae*, van Hall.) can attack the leaves, petioles, and fruit of citrus trees, particularly the lemon.

On the fruit, the disease manifests itself as sunken, black spots, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, and under the favorable conditions of cool, moist weather, such spots may extend to $\frac{3}{4}$ inch or longer. Where numerous lesions occur on the fruit, they sometimes become confluent. During development, the sunken pitted areas change colour from light-brown to black.

Experimental work has shown that damage caused by any form of mechanical injury such as bruises, hail, or frost is essential before the organism can gain an entrance and initiate the development of Black Pit. Hail and frost injuries are particularly suitable, and this accounts for the severity of Black Pit during the present season.

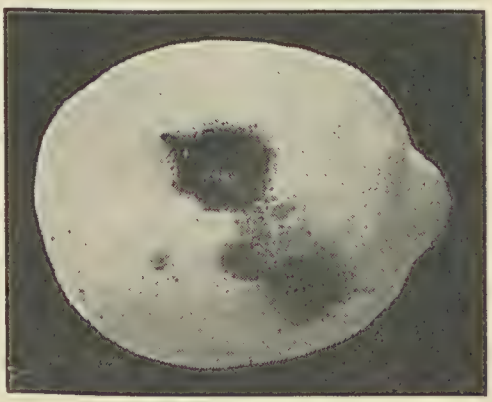
The disease is carried over from one season to the next in diseased fruits left on the tree or lying on the ground. The organisms concerned are readily spread by wind and rain from these foci of infection and it is essential for the control of this disease, that efficient sanitation be practised by the removal of diseased fruits from the tree or ground.

As damage to the citrus fruits is necessary for the initial infection, any provisions which reduce this risk will aid in the control. In this regard, windbreaks and the use of thornless varieties will help.

Spraying with Bordeaux mixture, 3 : 3 : 50 spray containing 1 lb. of lime casein spreader, in the autumn and spring may assist in reducing losses from this disease. Trees so sprayed should not be fumigated with hydrocyanic acid gas for scale control.

THE GOOSEBERRY WEEVIL

The Gooseberry Weevil (*Ecrizothis inaequalis*) is a native insect which has adapted itself to certain introduced plants, particularly the gooseberry, in some berry-growing districts of Victoria. The



Black pit of lemon.

Damage to young shoots of the gooseberry bush caused by gooseberry weevil.

grey to brown adult is about one-fifth of an inch long and has the typical "snout" of the weevil family. Wings are present, but functionless.

Serious loss of crop occurs when the adult weevil feeds on the young buds just as they are opening, and thus prevents the production of fruit. This occurs in seasons favorable to the early emergence of the weevils. In other seasons, the weevil does not reach the bush until the young shoots are several inches long. It eats into the stems of these shoots causing them to break off or dry out. New shoots are produced by the plant to replace those destroyed. During the winter, the larval stage, a small white grub, feeds on the roots of the plant.

In the early spring the larvae make their way to the top 3 inches of the soil and construct small earthen cells in which they pupate. After about three weeks the adult emerges, climbs up the host plant, and commences to feed. The emergence of the beetle takes place over a period of approximately six weeks. Egg-laying commences towards the end of November, the eggs being laid in the surface layer of the soil.

Control

Experiments conducted by the Biological Branch of the Department, in areas where this pest is prevalent, showed that the most satisfactory control is obtained by means of a spray of lead arsenate paste 10 lb. (or 5 lb. of powder) to 80 gallons of water, to which is added 1 pint of white spraying oil. This spray should be applied when the weevils first make their appearance, or when the first green shoots appear on the plant, and again about three weeks later. As most of the damage is done to the stems of the young shoots, particular care should be taken to ensure that the spray reaches these parts of the plants.

Dusting with a 50 per cent. lead arsenate dust will give satisfactory control when applied as recommended for the spray, but it is not as effective as the latter.

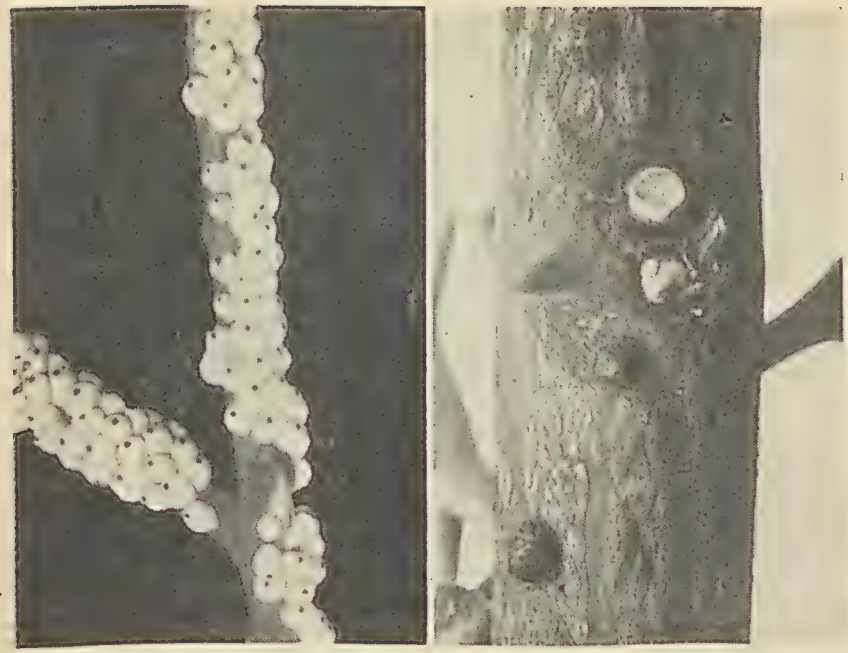
SCALE INSECTS

Scales are members of that big insect order (*Hemiptera*) commonly known as "bugs." They are, however, a highly specialized group and comprise the family of Coccids (*Coccidae*).

Appearance

To the untrained eye, scales sometimes appear to be fungus spots, but may be distinguished

Adult gooseberry weevil (enlarged).



Left—Eucalyptus scale. Right—Olive scale (*Saissetia Oleae* Bern.) on twig of orange.

from fungus by the way in which the insect can be prized from the plant leaving a smooth, whitish surface or, possibly, a mass of eggs. Also, on carefully applying pressure to living scales and at the same time watching carefully, the body fluids will be seen to exude from beneath the insect.

A sooty mould (*Capnodium* spp.) is often found in association with certain species of scale insects, and actually subsists on the sugary excretions of the insect. When the scale is destroyed, this fungus soon dies and will eventually weather off the foliage and twigs.

Types of Scales

Broadly, there are four types of scale insects—Flat or Shield scales; Soft Scales; Mealy-bugs and Gall Scales. The last group is not important in orchard and garden economy and will not be described.

The first type lives beneath a flat, or slightly raised, shield of wax of oval or circular shape. Of the adults only the male ever emerges from this cover. A few examples of the shield type are—Red Scale of citrus, roses and ornamental shrubs and trees; San Jose Scale of pears and apples; Oleander Scale, and White Scale of the rose.

The second type, Soft Scale, is round or oval in outline but is more raised up, the body of the adult being about equal in depth and diameter. The young scales are very soft and oval in shape; intermediate stages are tougher with a rubbery texture, while the adult exterior is quite hard and brittle. Colour varies from pale greenish amber to biscuit and through olive to black, depending on the species and the age of the specimens.

The two species of this group most commonly encountered in Victoria are—Soft Brown Scale and Olive Scale; both are at home on a wide range of host plants. Daphne is frequently infested with a black oval scale, also of this group.

Members of the third type are better known as Mealy-bugs, and are characterized by the presence of long, fine spines and quantities of

Olive scale, on grape fruit. Note sooty mould, usually associated with this pest.

greyish-white, mealy, or filamentous, waxy substance over the insect's body, or at the posterior end. The most familiar examples are Cottony Cushion Scale of pittosporums and citrus and the long-spined mealy-bug of maiden hair fern and other glasshouse plants. Control of species in this group by spraying or fumigation is difficult; the infested parts, where possible, should be pruned out and burned.

Habits and Life History

Scale insects feed by inserting very fine, sharp mouth parts into the fruit, leaf, stem, or bark of the host plant and sucking out the plant sap. It is believed that in some cases the insect also returns to the tissues, a substance which is toxic to the plant, thus aggravating the damage done.

Reproduction is either by means of eggs, as with Apple Mussel Scale, or by birth of living young, as with Red Scale. In the latter case, reproduction is sexual, fertilization by the male being essential, while with Olive Scale, reproduction is asexual, no male of the species having been recorded in Australia.

In all cases, the larvae have six legs, eyes, antennae, and other appendages. These free-moving youngsters are known as crawlers. They crawl out from the point of origin and settle down at a fresh spot, usually not far from the mother, but in very warm weather they may travel to the extremities of the plant or tree. Dispersion of crawlers from tree to tree and from one garden to another, is frequently effected by wind transport, but propagation with infested buds or cuttings is also responsible. Carelessly discarded fruit or peel and wind-blown infested leaves, also serve to spread these pests.

Navel orange infested with Red scale (*Aonidiella Aurantii* Mask.)

Daphne scale. (*Lecanium Nigrum*)
(Immature and adult stages.)

The insect usually attains the adult stage after two moults, which may occupy from 25 to 60 days, the longer time being required in cooler weather.

Control

No control programme, adequate for all species of scales or for all the plant hosts of any one scale species, could be given, since the insecticides to use and the best strengths and times of application will vary with the growth stage, and condition of the plant. In general, insecticides are also "planticides." Fortunately, the plant will usually survive concentrations which will kill most of the insects. The margin of tolerance, shown by the plant above that required to kill the insect, is narrowed when the plant is unhealthy, or when in very dry soil, and during hot weather. Tender glasshouse growth and flowers, or newly set fruits, are also liable to injury by concentrations of spray or gas which may be given with safety to the same plants grown in the open, or with more mature foliage and fruit.

There are four useful means of scale control:—

Biological; the introduction and encouragement of insect predators and parasites.
By spraying with petroleum oil emulsion.
Fumigating with hydrocyanic acid gas.
Pruning and hand treatment.

Biological control, although extremely valuable, is not complete, and when conditions favour the scale rather than the predators or parasites, man must step in with sprays, &c.

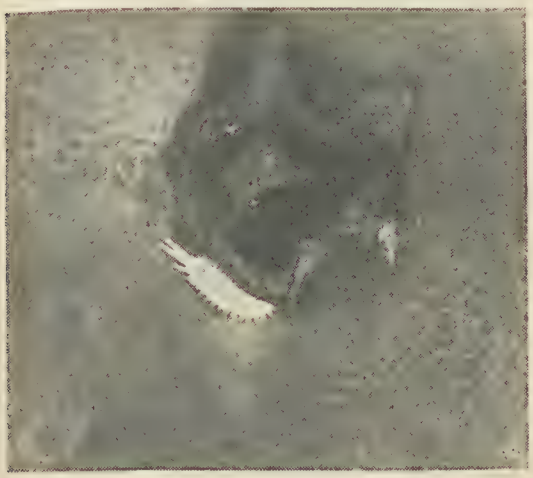
Dormant deciduous trees should be sprayed in winter, between leaf fall in autumn and bud-burst in spring, with red or white oil emulsion at the rate of 1 gallon of stock to 20 gallons of water. When blossom or foliage is present on the tree, red oil should not be used. With scale-infested apples and pears, it will usually be advantageous

to add ½ to 1 gallon of oil per 100 gallons to the early and intermediate codling moth sprays.

For citrus and soft ornamentals, October and November spraying is not recommended, although a 1 per cent. oil spray may be used at the end of November. A 2 per cent. oil spray may be used in December and January, while in February and March, a normal 1 gallon of oil stock in 40 gallons of water will be safe and advantageous for shield species of scales.

Autumn and winter oil spraying of citrus may be done except where the trees are suffering extremes of dryness or water logging, or in pockets subject to frost risk. As mentioned previously, for spring flowering plants, sprays, preferably, should not be applied after advanced blossom bud development of winter flowering species has commenced. Glasshouse plants should be sprayed when in the most dormant or least active stage of existence and not when the flower shoots are developing. Use one ounce of mayonnaise emulsion of summer white spraying oil in 5 pints of water. When mealy-bugs are present, add 1 teaspoonful of nicotine sulphate.

Fumigation with a granular or powdered form of calcium cyanide is an effective and easily applied method of treating scale-infested trees and shrubs. This dust, which is extremely poisonous to humans, may be purchased in 1 lb. and 5 lb. press lid, gas tight tins, and should be handled and applied with extreme caution according to the manufacturer's instructions on the tin. It is not intended in these notes to give full instructions on cyanide fumigation. Persons requiring such, are advised to make further enquiries from the Biological Branch of this Department, stating at the same time the nature and situation of the plants it is proposed to fumigate. A few broad principles, however, may



Mealy bug on the calyx of a pear.

Gall produced by a scale insect. (Apiomorpha Fletcheri).

be stated. The tree to be fumigated is covered with a calico sheet, which contacts the ground all round. Measurements are then made from ground level to ground level over the highest point of the tree, also of the circumference about three feet from the ground. The dose of cyanide powder to be dusted on the soil beneath the tree is read off from a prepared chart supplied by the manufacturer. The sheet remains for at least 45 minutes with the charge beneath it before being removed to the next tree. A calico-covered frame may be constructed for covering small shrubs or potted plants for cyanide fumigation. Almost any shrub or tree in the open may be safely treated in the months of February to April, but unless previous experience to the contrary has been obtained, the work should be done at night or in the absence of direct sunlight.

Pruning and burning, as mentioned for all mealy-bug infestations, are very desirable also for infested roses, currants, vitis vines, creeping ivy, and the like.

Hand treatment of scale, refers to orchids and aspidistras in particular. The leaves may be wiped with a brush or rough cloth dipped in an oil emulsion of 2 per cent. strength.

Precautions

When spraying pot plants and garden shrubs, the foliage should be thoroughly drenched, but soil should be heaped temporarily against the butt of the plant, or the pot filled with soil, to shed the surplus spray. A careful note of the following is advised. Do not spray citrus with oil following a Bordeaux spray until six months have passed, and do not fumigate sooner than twelve months after an application of Bordeaux. Where Bordeaux is necessary, it may be applied several days after fumigation. Curiously, oil and Bordeaux may be applied as a single combination spray without plant injury.

KITCHEN NOTES

By RACHEL M. PEILE,
Fruit Preserving Expert

Meat and Meatless Dishes

SOME cheaper cuts of meat, often unpopular, can be used to make appetising dishes. They are cheaper to buy and are just as nutritious and rich in food value as the more expensive cuts. It rests with the housewife, however, to see that she is not served with meat that is too gristly or fatty.

Scraps of fat cut from the meat can be rendered down or placed in the baking dish with the joint. After being melted down with the joint it is delicious used in sandwiches and particularly good for children's lunches.

A little vinegar added to any meat will help to soften the fibres.

A list of cheap cuts of mutton are given, with ways in which they can be served :—

Neck	Stews, curries, soups.
Shoulder chops ..	Stews, curries, soups.
Leg chops ..	Stews, curries, soups.
Head	Stewed, braised, soups.
Shank	Stews, curries, roasting, soups.
Forequarter ..	Roasting, chops can be stewed or braised.

Liver, kidneys, and brains are particularly rich in body building material and minerals such as iron, and these foods should be used more often.

When baking or stewing meat, it should be started at a high temperature to keep in the juices; then it should be completed by longer, slower cooking. By this method the protein in the outer surface of the meat is quickly coagulated and the inner juices are prevented from escaping.

When meat is needed primarily for soup, it should be placed in cold water and heated gradually. This extracts the juices which are used with the water.

Meat should never stand in cold water as the juices will be drawn from it, and undesirable matter will soak in. Always unwrap meat as quickly as possible after buying, and hang it up, otherwise some of the juices will be absorbed by the paper.

A little sugar added to stews and braised meats will improve the flavour. Vegetable water may be used for stews.

Recipes for cheap and nutritious meat dishes are given hereunder :—

Mutton Roll. (6 Servings.)

1 lb. lean mutton pieces.
2 slices lean bacon.
1 cup breadcrumbs.
1 small onion.
1 tablespoon chopped parsley.
1 tablespoon chutney or pickles.
1 egg.
1 dessertspoon flour.
Pinch herbs.
Salt and pepper.

Trim meat, bacon and onion, and mince. Add the other ingredients. Mix well together, then shape the mixture into a loaf for roasting. It will take 1¼ hours in medium oven. Baste well. Turn it on to a bed of dried breadcrumbs, roll it in the crumbs, then return to the oven to brown.

Casserole Steak. (6 Servings.)

2 lb. stewing steak.
2 tablespoons wholemeal or plain flour.
1 tablespoon sugar.
1 dessertspoon Worcestershire sauce.
1 dessertspoon tomato or plum sauce.
2 cups water.
1 teaspoon lemon juice.
Salt and pepper.

Mix some of the flour and sugar and rub into the steak. Put the steak in a casserole or 2 pie dishes placed together. Mix the rest of the flour and sugar with the sauces, lemon juice, salt and pepper. Add the water, mix thoroughly and pour over steak. Cook slowly for 2 hours.

Mutton Flap with Seasoning.

Mutton flap.
1 oz. good dripping.
1 tablespoon chopped parsley or 1 teaspoon chopped sage or thyme.
2 tablespoons milk or 1 egg.
6 tablespoons breadcrumbs.
Little chopped onion.
Pepper and salt.

Rub dripping into crumbs, add seasoning and other ingredients. Moisten with milk. Lay it over the flap and roll the flap up. Tie with string. Bake according to size of flap.

A boned loin of lamb also may be baked this way. Press the stuffing on chop end of loin. Roll up the meat and tie. Bake according to size.

The bones from above may be covered with cold water. A little grated carrot, turnip and sliced onion added and brought to the boil. Macaroni or "Mex," which is excellent, may be added when the mixture is boiling. Flavour with pepper, salt and a little sugar and serve at the same meal.

Meat Pudding.

3 lb. beef steak or cold lean meat.
1 egg.
Mixed herbs or 2 tablespoons chopped parsley.
1 cup stale brown-bread crumbs.

If using cold meat, add small cup of brown gravy or stock. Mix all together and boil for 2 hours if using fresh meat, or an hour if using cold meat. Serve with gravy. This makes a large quantity.

Ragout of Mutton.

1½ lb. scrag end of neck of mutton.
1 cooking apple.
1 oz. fat.
1 pint water.
1 onion.
1 turnip.
1 tablespoon flour.
1 tablespoon barley or Mex.
Salt and pepper.

Cut meat into neat pieces and fry in fat. Fry onion and add flour. Add water, pepper and salt. Add meat, diced turnip and sliced apple and barley or Mex. Put in saucepan or casserole. Cook very slowly for 2 hours. Serve with plenty of chopped parsley.

Savoury Sausages.

1 lb. sausages.
1 lb. potatoes.
½ lb. onions.
1 apple.
Salt and pepper.

Slice the onions, apples and potatoes. Place in a saucepan or casserole with the sausages on top. Pour on half pint of water or stock and cook slowly for 40 minutes.

Rabbit Baked in Milk.

Joint a rabbit and soak in salt water for 1 hour. Lay the pieces in a pie dish with 2 tablespoons dripping. Add two rashers of bacon, cut in half, then sprinkle over the rabbit and bacon some seasoning, made by mixing together 1 cup breadcrumbs, a little finely chopped onion, 1 dessertspoon mixed herbs, pepper and salt, and 1 teaspoon butter. Pour over ¾ pint of milk and ¼ pint of water. Bake slowly till rabbit is tender.

Pot Roast Rabbit.

Soak a rabbit in salt water for 1 hour. Drain it and fill with seasoning, then sew up firmly. Boil it gently for 1 hour. Pour off the water and put in saucepan with ½ cup dripping and roast steadily for another hour. The water may be used for gravy or for making soup. This is an excellent way for cooking older rabbits.

Mock Duck. (Rich in Iron and Vitamin B.)

1 liver washed and dried.
1 tablespoon chopped parsley.
1 teaspoon butter.
1 tablespoon milk.
Brown-bread crumbs.
Small onion.
Salt and pepper.

Cut a pocket in the liver. Fill with seasoning. Place in baking dish with fat and bake slowly for 1 hour. It should be basted well. Serve with brown gravy.

Liver should not be soaked in salt water before using, as large amounts of the minerals and vitamins are drawn and left in the water.

Liver and Turnip Pie.

1 liver.
Breadcrumbs.
Gravy or stock.
Mashed turnip.
1 onion.
Dripping.
Mashed potatoes.

Wash, dry and slice liver. Put a layer of mashed potatoes in the bottom of a greased pie dish. Add a layer of sliced liver. Sprinkle with pepper, salt and a little chopped onion and parsley. Spread a thick layer of white or swede turnip over. Pour over a little gravy or stock. Sprinkle thickly with breadcrumbs. Dot with dripping and bake 1 hour in moderate oven.

Apples with Liver. (Minerals and Vitamin B.)

1 liver.
1 onion.
Water or stock.
2 large apples or 2 oz. dried apples.
2 rashers of bacon.
Pepper and salt.

Cut liver into thin slices, put into a greased pie dish. Chop the apples (dried apples should be soaked for 1 hour beforehand) and onion. Season with pepper and salt. Place a mixture of this over the liver, cover with bacon and pour over ½ pint of stock or water. Cover pie dish and cook for 1 hour. Take off cover for last 10 minutes, and brown.

Cooking an Old Fowl.

Stuff the fowl with seasoning, then rub the breast with a cut lemon. Steam it gently for 1 to 2 hours. Then place in baking dish and roast in usual way. The carcass when boiled afterwards makes excellent chicken broth.

Some Meatless Recipes

Cheese is an excellent source of protein, and can be served in many different ways.

Some meatless recipes are given which include eggs, cheese, and dried peas and beans.

Cheese and Onion Savoury.

1 lb. onions.
¼ lb. cheese (tasty).
Breadcrumbs.
1 tablespoon butter.
Salt and cayenne pepper.

Boil the onions, drain, and put finely chopped, into a pie dish. Cover with grated cheese, season well. Put a layer of breadcrumbs on top, dot with butter and brown in the oven.

Use the onion water for soups or gravy.

Tomato Pie.

Short crust.
Tomatoes (bottled or fresh).
Grated cheese.
Salt and pepper or cayenne.

Line a pie dish with a thin layer of short crust. Place in it a good layer of cheese and season with salt and pepper. A little sliced onion may be added if liked. Cover with a layer of sliced tomatoes, then more grated cheese. Bake 20 to 30 minutes. Mashed potatoes or breadcrumbs may be used instead of pastry.

Bean Rissoles.

½ lb. haricot or butter beans.
1 oz. sultanas.
1 tomato.
1½ oz. butter.
1 oz. flour.
Brown-bread crumbs.
1 dessertspoon curry powder.
Salt and pepper or cayenne.
¼ pint of water.

Soak and boil the beans till soft, rub through a sieve. Heat butter and fry sliced tomato. Add flour and curry powder. Stir till thick, add water and stir till it boils. Add seasoning, sultanas, beans, breadcrumbs. Mix well. Shape into rissoles. Fry in plenty of fat or bake in moderate oven. Serve with tomato sauce or gravy.

Peas au Gratin.

8 oz. dried peas.
1 level dessertspoon flour.
½ oz. butter.
3 oz. grated cheese.
Salt, cayenne pepper, and milk.

Soak the peas for 12 hours. Boil them until tender and drain well. Add the butter and cheese and a little milk. Stir well together and serve on buttered toast or with potato chips.

Eggs with Mushrooms.

5 eggs.
1 cup sliced mushrooms.
½ cup milk.
Buttered toast.
Salt and cayenne pepper.

Fry mushrooms in good dripping. Cook for 8 minutes. Add beaten egg and milk. Cook slowly until mixture thickens. Serve on buttered toast.

Cottage Cheese. (Delicious and easy to make.)

Place a bowl of freshly skimmed milk in a warm place until it is thick—a teaspoon of sour milk can be used to start it. When the milk has set firm, pour into it ⅓ as much boiling water as there is milk, leave 10 minutes, stir carefully, and pour the whole into a muslin bag. Leave for a day to drain, squeeze all moisture from the curd, and add salt to taste. It is now ready to use and can be spread on toast, bread, or biscuits.

Different Cuts of Mutton

Cuts.	*Uses.*
Forequarter	Chiefly for roasting.
Forequarter chops	Stewing.
Shank	Broth.
Breast	Pies and broth.
Neck	Stewing.
Hindquarters—	
Leg	Roasting or boiling.
Loin	Roasting or chops.
Rib Loin	Cutlets, grilling, or frying chops.
Flap	Stewing.

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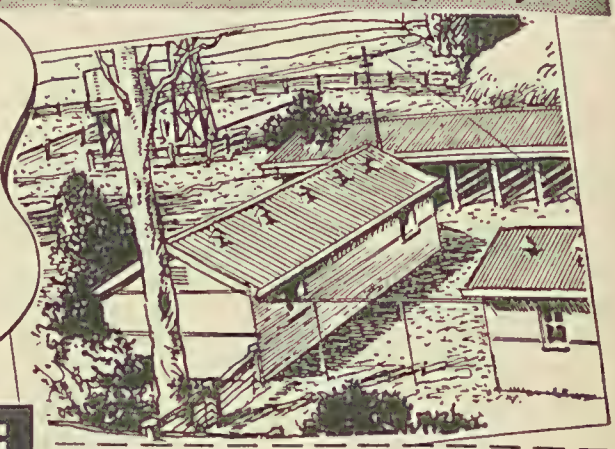

HARDIE'S GENUINE FIBROLITE
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By Officers of the Horticultural Division

THE information provided in this article is issued as a general guide to the many inexperienced vegetable growers who are responding to the appeal to grow vegetables in the home garden. The tables at the end of the article supply information on varieties, planting dates, methods of sowing and approximate quantities required for a family of five; cultural hints are given in the preliminary text.

Layout of Garden

Choose a site which is not shaded, particularly in winter, and is sheltered from winds. The rows of plants should run north and south if possible, but not up and down hill. Beds 4–5 feet wide are convenient to handle. In heavy soils and in light soils in winter build the beds up 6 inches above the paths. If the soil is shallow, build up the beds to provide 12 inches of good soil. The edges may be kept neat with boards, or with narrow strips of perennial plants such as herbs.

Soil Preparation

Do not dig or cultivate the soil while it is sodden. Deep working is advisable. Trench the beds to 18 inches, but avoid bringing the sub-soil to the surface. Bury vegetable waste deeply, for mixing with the top-soil at the next trenching.

Spell each plot for at least a fortnight between crops, leaving the soil roughly dug over. Break the surface down finely just before planting.

Once a year, preferably in autumn, the freshly-dug bed should be limed at the rate of about half a pound of agricultural lime per square yard. Following such liming, it is a good plan to leave the bed in the rough for two or three months. A few crops can be grown in the winter, but much of the garden is best left dug over in preparation for the valuable summer crops.

Finely-sieved ashes from the burning of garden prunings or wood fires also may be used, but other ash or unsieved ashes should not be thrown on the vegetable garden.

Final preparation of the soil for planting consists of a heavy watering if the ground is dry, and working down to a fine tilth and levelling when the soil is nicely moist, say, two or three days later. Plant seeds the same day.

Manuring Before Planting

Use animal or fowl manure if obtainable. It will pay you and help the country, because artificial fertilizers are scarce. Do not use these manures fresh on any crop—let them rot in a heap for three or four weeks, or work them into the soil three or four weeks before planting, except that beetroot, carrots, or parsnips should not be planted within *three months* of applying such manures. Up to 4 inches of animal manure or 2 inches of fowl manure spread over the soil and worked in is good. No artificial fertilizers are then necessary before planting.

If sufficient animal manure is not available, work as much plant waste or compost as possible into the soil and apply artificial fertilizers either with the waste or in the final soil preparation. If relying on artificial fertilizers, it is well to remember that *all* vegetable crops require superphosphate—1 oz. to the square yard worked in before planting. (A match box well filled holds an ounce of fertilizer.) Root crops and onions require, in addition, half an ounce of sulphate of ammonia or nitrate of soda, or 1 oz. of blood manure per square yard, and leaf crops need double these quantities. Peas and beans require mainly superphosphate. Market garden manure is a popular general-purpose mixed fertilizer, and is used at the rate of 1½ oz. per square yard.

Sandy soils would benefit from half as much fertilizer again as the above quantities.

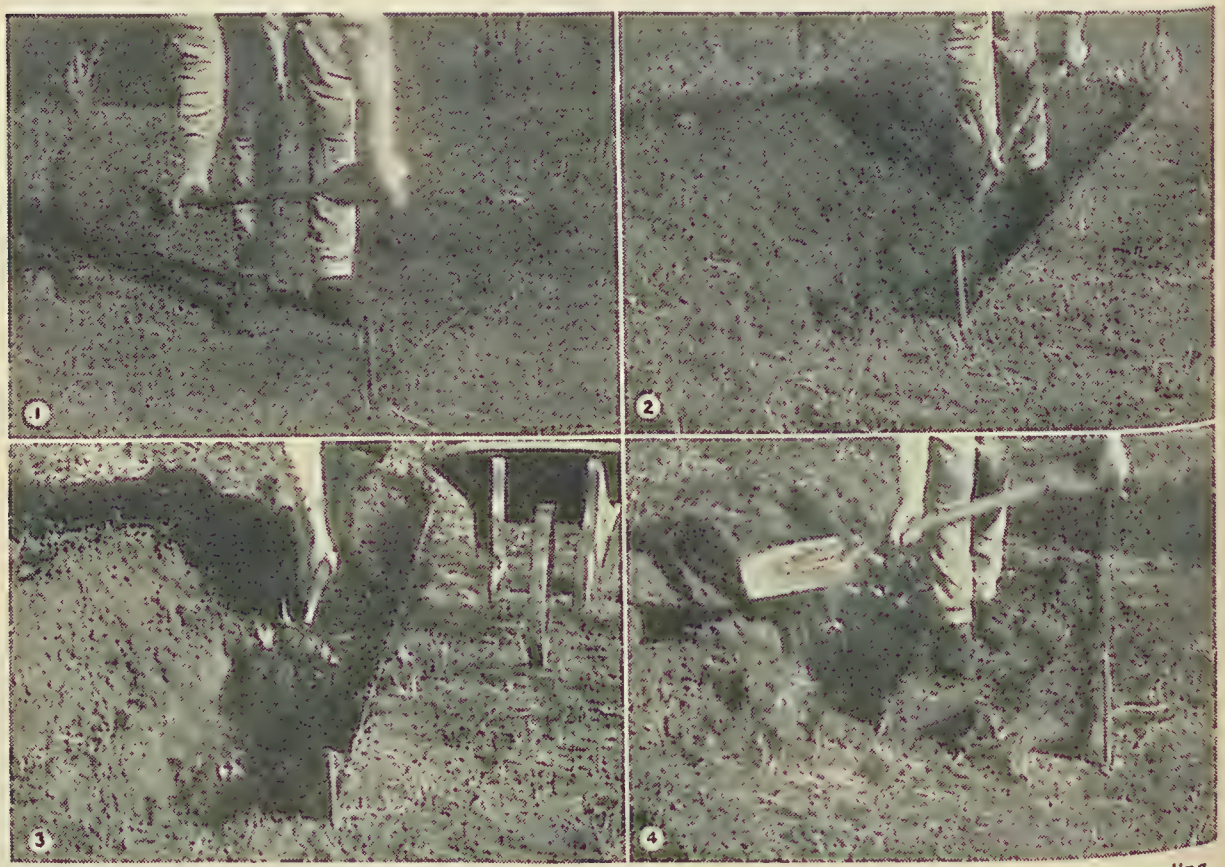
Do not apply fertilizer in contact with seed; but work it into the soil just below the rows before planting.

Making Compost

Some gardeners just dig plant refuse in as it becomes available, others dig a hole to get rid of it, or else burn it. The best way is to turn such refuse into compost. There is no difficulty in making a compost heap. The resulting compost is far more valuable than unrotted refuse and will provide a reserve for use at any time a new bed is being prepared.

Suitable material includes weed growth, grass cuttings, leaves, and any garden waste except couch grass and wood prunings. These latter should be burnt and the ashes added to the heap. The house can contribute vegetable refuse and sieved wood ashes or indeed anything that will rot down fairly quickly. Select an out-of-the-way corner for your compost heap. Dig out a hole about 6 to 8 inches deep and stack the soil for use in building the heap. Spread a liberal dusting of lime at the bottom of the hole. As the refuse becomes available build a well-trampled layer of the rubbish about 12 inches deep. Sprinkle this with lime and cover with about 2 inches of soil. On top of this soil, sprinkle a mixture of two parts of superphosphate to one part of sulphate of ammonia at the rate of one handful to the square yard.

Continue to build the heap, layer by layer, in a similar way until it is about 4 feet high and never let it become dry. As soon as it has



Trenching the soil—1. Opening the first trench. 2. Turning the soil at the bottom of the trench. 3. Spreading compost of stable manure on the bottom. 4. Turning top spit of second trench into first trench.

reached this height, turn the whole heap over and the whole compost will be ready for use in a month, or if necessary, the original layers, which should now be on the top, can be used right away. It is desirable to have two heaps at least, one in the course of building and the other for immediate use.

Sowing Seed

In the national interest, vegetable seeds should be used as economically as possible. The home gardener usually sows far too thickly. Planting details are given in a table on page 562. Where small seeds are sown rows are best covered with fine soil, or a mulch of fine stable manure or chaff, to prevent caking of the surface. A strip of hessian or bagging laid along the rows is also effective. Another plan is to plant the seeds at the bottom of a wide shallow trench, and cover with a board. If the soil is moist at planting, no watering will then be necessary until the seedlings have appeared. These covers should be removed as soon as the plants come through the ground. Perfectly straight rows are necessary for ease in later cultivations. Always use a planting line or a straight edged board. The latter has the advantage that it may be walked on during planting.

Captions to Illustrations.

Sowing Small Seeds—

1. Opening drill with pointed stick.
2. Spreading the seed.
3. Covering lightly with fine soil. Drill is not completely filled.

Seed Treatment

Among commercial growers "pickling," that is, dusting seed with a fungicidal dust before sowing, is common. The home gardener can do this simply by shaking seed in a glass jar with a small quantity of Cuprox or Agrosan or similar dust. This protects the seeds against certain diseases, especially under wet conditions. Sieved through ordinary fly wire the surplus dust may be kept for future use.

Watering

Water well before preparing the surface finally for sowing. Unless the rows are covered with a board, lightly water after sowing, and in hot weather water lightly once or more each day until the seedlings are 1 inch high. In cool

Transplanting—1. Weeding and thinning the seed bed. 2. Lifting the seedlings with fork. 3. Planting with a dibble. 4. Watering.

weather keep the surface moist with less frequent waterings. When plants are firmly established, water deeply once or twice a week. Most crops are better watered by a furrow rather than a sprinkler, especially lettuce in the cool months. The vegetable garden needs more water than the flower garden to keep it in vigorous growth.

Thinning

Thinning of the rows when necessary must be carried out at the proper stage of growth. This stage and the correct distances between plants left are given in the tables. Two thinnings are sometimes necessary. Thin carefully to avoid disturbing the plants left, and water well immediately afterwards. You may transplant the thinnings from silver beet, onion, leeks, and lettuce. Thinnings from carrots and parsnips should be discarded. Red beet thinnings may be used to fill gaps in the row.

Transplanting

Use well-developed seedlings and plant in the cool of the evening. Keep as much soil on the roots as possible. For convenience in planting arrange tall seedlings, such as cabbage, cauliflower, and onion, in a bundle so that the bases of their stems are level. Then with one cut of a sharp knife trim the roots to a uniform length. The correct depth of planting is important: too deep and too shallow planting are equally undesirable. Most seedlings should be planted so that the stem of the lowest leaf is brought to ground level. After planting, firm the soil round the plants and water, preferably with a solution of $\frac{1}{2}$ oz. of sulphate of ammonia or nitrate of soda and $\frac{1}{2}$ oz. of superphosphate per gallon of water applied with a watering can. In hot weather, shelter transplants with, for instance, small flower pots, if available, or pieces of brushwood.

Cultivation

Keep weeds down and the soil surface loose by light cultivation when necessary. A surface mulch of stable manure or lawn clippings will assist. Do not use a cultivating implement within an inch or two of the vegetables or they may wilt, due to the surface roots being damaged. Closer weeding must be done by hand.

It is most important to remove weeds while still small rather than to allow them to develop extensive root systems, the growth and removal

of which interferes with the roots of the vegetables. In most soils, if weeding is done at this early stage, the work may be considerably lightened by scraping the weeds carefully away using, say, an old table knife. This will be found much quicker than pulling by fingers and thumb.

Manuring During Growth

If the growth of leaf crops, beetroot or tomatoes slackens before maturity, work in an ounce per square yard of sulphate of ammonia or blood manure. In the case of silver beet and Chinese cabbage and other vegetables which produce over an extended period, half an ounce of sulphate of ammonia or its equivalent per plant every month or so may be found necessary. Rapidly growing plants like lettuce will benefit from lighter but more frequent applications. Do not work in manure within 6 inches of the stems of the plants.

Liquid manure, either 1 oz. of sulphate of ammonia or nitrate of soda per gallon or a weak extract from animal manure, is also a good stimulant. Apply with a watering can about once a fortnight and if the leaves are splashed water them lightly with a fine hose to wash off the fertilizer.

Rotation

The ideal sequence of crops on a plot is :—

1. Leaf crops and tomatoes—using stable manure or compost, if available.
2. Root crops and onions—avoid using stable manure, use superphosphate and sulphate of ammonia.
3. Legumes—use superphosphate only, dig in plants after picking pods.

Then start again at the leaf crop. Avoid using crops of the same type or of the same family on the same plot twice in succession ; for instance, do not follow carrots with parsnips, cabbages with cauliflowers, onions with leeks, tomatoes with potatoes.

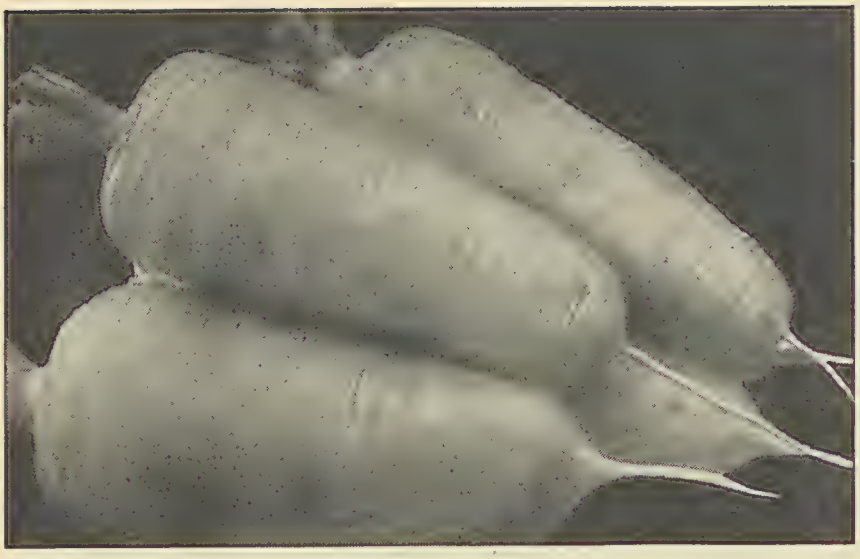
WHAT TO GROW

The best vegetables to grow in a very limited home garden are probably carrots, parsnips, and red beet, lettuce and silver beet, broad beans, dwarf and climbing beans, tomatoes and early onions.

Other vegetable crops listed in the planting table require larger areas and, in some cases, more attention to make it worth while growing them. Many, however, are in short supply on the market, and the owner of the larger garden will find a place for them.

Planting at correct depth is important.

1. Too shallow. 2. Too deep.
3. Correct depth.



Chantenay Carrots.

The various crops are discussed approximately in the probable order of their value to the home gardener.

Pests and control measures are described in a separate section at the end of this article.

Carrots, Parsnips, and Red Beet

These are the chief root crops. Carrots are a particularly valuable foodstuff. Carrot and beet seed is usually good for three years, parsnip for only one. It is best to buy only enough seed for one year's planting. The soil needs to be deeply and finely worked, and not rich in fresh organic matter. Plant a few radish seeds in each row to break any crust and help the delicate carrot and parsnip seedlings through. Thin the rows of seedlings in the two-leaf stage to 1 inch apart, later on thinning to 2 to 3 inches apart. Red beet seedlings may be transplanted but carrot and parsnip seedlings do not transplant successfully. Even for red beet transplanted roots are of poorer quality and are useful only for filling up gaps in the rows. In cultivating between the rows the earth should be slightly mounded up around the growing plants.

Use the tops of red beet as an alternative to spinach or silver beet. Store mature roots of carrot and beet by lifting and replacing in the ground with tops removed, or in a cool cellar. Parsnips may be simply left in the ground after the tops have died down, but should be lifted if the tops re-commence growth.

The chief pest is carrot aphis on carrots and parsnips.

Silver Beet, Spinach, and Chinese Cabbage

Silver beet occupies a bed for eight months or more, but may be picked continuously if regularly fertilized. Chinese cabbage is similar in habit and in use, and provides an agreeable change. Spinach, although of high nutritive value, is difficult to grow and gives only one cutting. For this reason, successional planting of small areas is necessary, and the correct variety for winter or summer should be chosen.

To keep silver beet and Chinese cabbage in vigorous growth to provide prolonged cropping, side dressing with manure is necessary at intervals of a month or so.

Chief pests are snails and slugs, and the chief disease of spinach is virus.

Lettuce, Endive, Cos Lettuce

For successful growing of lettuces, the correct varieties for the season should be used. Soil well manured prior to planting is essential and frequent side dressings of liquid manure, as previously described, at up to fortnightly intervals are more necessary for lettuce than most other crops.

Irrigating by furrows is the best means of avoiding slime or mildew, the chief disease to which this crop is subject. Overhead watering encourages slime.

Typical Red Beets.

Left—Detroit Dark Red. Right—Early Wonder.

The cultivation of endive—sometimes called curly lettuce—is similar to that of lettuce, and it is used similarly. It grows better than lettuce in the winter months and is generally less liable to diseases. The endive plant does not heart tightly. Its leaves are attractive and may be pulled at any time for garnishing salads, and the plant, when fully grown in ten to thirteen weeks, is cut for salads. All the leaves are usable.

Endive is valued by many people because of its slightly bitter flavour, but if desired, the bitterness may be removed by blanching the plants.

Liming should be a regular autumn practice.

This is done by tying the leaves up and covering the plant with a pot or box when about 7 inches high.

Cos lettuce is another of the lesser known salad vegetables which is cultivated like the common lettuce and does well in the winter months.

Chief pests of these salad crops are slugs, snails, and aphis.

French Beans and Climbing Beans

These "legumes" are frost-sensitive. Do not plant them until frosts are over. Soaking of the seeds before planting gives little advantage over seeds planted without soaking, and sometimes encourages rotting of seed in the ground. Gather beans at frequent intervals to keep the plants producing. Cutting the beans from the plant rather than picking will prolong the life of the plant. Cut up excess pods finely and dry in the sun for winter use, or salt them down.

Chief diseases are halo blight and fusarium wilt and the chief insect pest is red spider.

French Beans.

Peas

Peas are another legume with high food value. They are not frost-sensitive, but are comparatively light producers. In small areas the planting of peas should be confined to the autumn and early spring plantings. Beans give a much better return from small plots in the summer. Although peas are not very susceptible to frost, they cannot tolerate continuously wet soil conditions, particularly in the early stages of growth.

Chief diseases are ascochyta and septoria blights.

Broad Beans

Broad beans, like peas, are not frost-sensitive, but will not set beans in cold or hot weather. Plant them in April and May so that they will flower in August and September. Pinch out the tops of tall-growing varieties when the first flowers are fully open, and use the young tips like spinach. The young pods can be used like French beans by cutting the whole pod up, or they can be left to develop fully. Shelled beans should be used while still tender. The plants respond to a good dressing of lime before planting.

Chief pests are aphis, and chief diseases are rust and root-rot.

Tomatoes

Varieties of tomatoes recommended for Southern Victorian home gardens are—

Early Crop—

Tatura Dwarf Globe, Burwood Wonder — Unpruned bush.

Chalk's Early Jewel, Earliana (Sunnybrook strain preferably) — Pruned, tall growing.

Midseason Crop—

Tatura Dwarf Globe.

Burwood Wonder.

Red Marhio, Marglobe, Walker's Recruit — Pruned, tall growing.

Method of pruning tomatoes.

Pruning consists of pinching out the laterals and retaining 1, 2, or 3 leaders. "A" denotes where the lateral growths should be pinched out and "B" the flower "sets" or fruit. When the plant reaches the top of the stake, pruning can be discontinued.—If early varieties are grown and early fruit is required, the top of the plant should be pinched back about the height of the top of the stake.

A plant of "Tatura Dwarf Globe", showing prolific cropping habit.

Late Crop—

Orange Prolific, Mortgage Lifter — Unpruned bush.

Eccles Surprise, Red Marhio — Pruned, tall growing.

It is desirable to tie even the unpruned bush varieties to 4-feet stakes as they grow. The tall varieties are tied to 6-ft. stakes and pruned to 2 to 4 leaders and the lateral shoots are nipped out. Walker's Recruit should be pruned to a single leader.

Tall pruned varieties require a 6-foot stake.

Seedlings should be planted deeply so that the lowest leaf is just above the ground. Overwatering should be avoided and furrow watering is to be preferred. Fruit should be picked as soon as it turns pink, and allowed to ripen on a shelf. This will help the plants to produce bigger crops.

In Melbourne and Southern Victoria generally, tomatoes planted early in August–September are much more subject to disease than those planted in October–November. Diseased plants are best removed and burnt.

Chief pests are cutworms and tomato moth grub, and chief diseases are spotted wilt, bacterial canker, leaf spot, and a rapid dying of the lower leaves (Fusarium and Verticillium wilt).

For a fuller description of the methods used in growing tomatoes and of the many varieties which can be successfully grown in Victoria, the Department's Bulletin "Tomato Culture" is recommended. It may be obtained on application to the Director, Department of Agriculture, Melbourne, for the sum of 1s. which includes postage.

Onions

Onions are easily grown, and are one of the crops which can be planted successfully in the winter. The early silverskin and flat white onions are excellent for cooking in spring when vegetables are scarce, but they do not store well. "Odourless" onions should also be much more extensively used for salads though they, too, are poor keepers. Early Globe are later in maturity and keep far longer, while onions of the type often known as "Spanish" but more correctly "Australian Brown" can be kept for many months after harvesting. The brown varieties usually store better than the white varieties, though long-keeping whites can be obtained. It pays to plant an area each winter to provide bulbs for cooking, and a succession of the early varieties is more particularly recommended.

The seed is best planted in a seed-bed, and the seedlings transplanted when 5 to 6 inches high. The roots and tops should be cut back, and the seedlings planted about an inch deep. The bulbs are mature when the tops have bent over and commenced to yellow off. The best way to store limited quantities of bulbs is to tie them in bundles of six or so by the dead tops, and hang in an airy shed.

Chief disease is onion mildew.

Spring Onions and Picklers

"Spring Onions" are grown by sowing White Lisbon or any early variety thickly in rows at any time during the autumn and spring and pulling as required while the plants are still small.

"Picklers" may be produced by allowing thickly-sown onions to form small bulbs.

Leeks

The leek has much in common with the onion, and is used both as a salad vegetable and for cooking.

The long white stem is the most tender portion, and the gardener should aim at producing plants in which this blanched section is at least 6 inches long. The centre green leaves are also edible.

The usual method of growing is to raise seedlings in a prepared bed and transplant when 6 to 8 inches high into a trench 4 to 5 inches deep. As the plants grow, the trench is gradually filled in, and the plants are eventually earthed up until at least 8 inches of the stems are excluded from the light.

For use as a salad vegetable leeks may be harvested immature, but for cooking, are better left until well grown. Leeks cannot be stored fresh and therefore should be harvested only as they can be used. However, they can be dried.

Cabbages, Cauliflowers, and Brussels Sprouts

It is most important that the right varieties of cabbages and cauliflowers be planted at the right time. Varieties planted out of season

Savoy Cabbage.

Green Sprouting Broccoli.

either produce poor hearts or run straight to seed. The seed is sown thickly in boxes or seed-beds, and the seedlings transplanted when about eight weeks' old.

Plant out the seedlings so that the lowest leaves are just above the surface of the soil. Too close planting will cause these plants to run to seed before full development.

Cauliflower hearts may be kept clean and white by tying the tips of the larger outer leaves together.

Sprouts mature their buds from May to September, the basal ones first, and these should be picked as soon as they are mature. When a "sprout" is a quarter to half grown the leaf below it should be plucked. If this plucking cannot be performed regularly the home gardener should at least pluck the leaves from the next higher series of sprouts at each picking of the mature ones just below.

Sometimes sprouts become "blown" or developed past the tight bud stage; this may be due to a poor strain of seed, excessive manuring with a nitrogenous fertilizer near maturity or a burst of warm weather. Such sprouts should be cut up and served like cabbage.

Chief pests are aphis and grubs. If sprays or dusts are used to control them, wash the heads well before cooking.

Fungous diseases of cabbages, &c., are difficult to control, but will be less prevalent in a well-limed soil

Borecole (Kale) and Sprouting Broccoli

These plants are a good substitute for cabbages and cauliflowers in small gardens. Borecole is a non-hearting cabbage which produces an abundance of leaves over a period of twelve months. These are picked at intervals and cooked like cabbage, and their flavour is similar. Six plants are sufficient for the average family. Sprouting broccoli produce a succession of small, cauliflower-like side shoots which may be harvested over three or four months. Twelve to fifteen plants will be found sufficient. Their cultivation is the same as for cabbage and cauliflower and they are subject to the same pests. Regular picking is necessary to allow later shoots to develop.

White Turnips and Swede Turnips

White turnips are very useful, because they can be grown practically the whole year round and reach maturity very quickly. Their flavour

Borecole or Kale—var. Green Curled.

[*Continued on page* 559]

The Small Poultry Flock

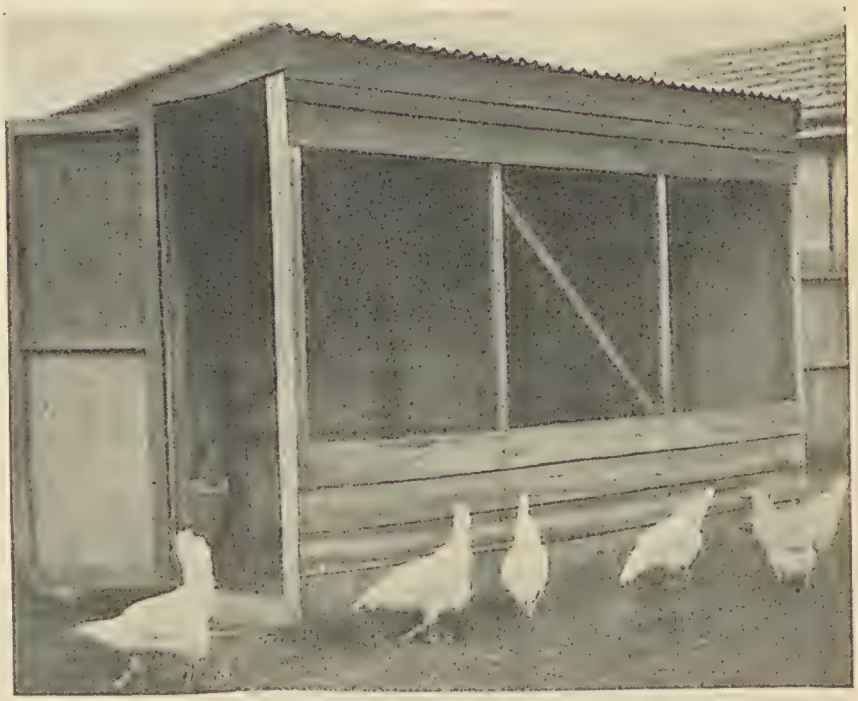
Egg Production in the Backyard

By H. F. CLINTON,
— Poultry Expert —

THE demand on Australia's 1944 egg output is expected to be heavy, and householders would be well advised to make themselves independent of commercial supplies by keeping a few fowls, at least until the period of shortage is past.

Where permitted by the local authorities, half-a-dozen hens could be kept for the production of eggs, and a few cockerels might also be reared in separate pens to supplement the household meat supply.

The poultry foods generally available could be used, such as bran, pollard and other meals; wheat or other grains; meatmeal; clean table scraps and chaffed green food. Shell grit and clean drinking water are essential. If preferred, foods specially prepared by various poultrymen's suppliers may be fed. A dry mash fed continuously in hoppers, with grain each evening, and the other foods mentioned, simplifies the feeding problem.



A few fowls are a good insurance against an egg shortage.
[*Sun* photo.

In feeding trials conducted recently at the State Research Farm, Werribee, satisfactory egg production was obtained by feeding a grain ration consisting of wheat, oats, maize and barley, with meatmeal added. Each variety of grain was placed in a separate compartment of the hopper, and made available to the birds continuously. Chaffed green food and shell grit were supplied as usual.

Where young chickens are purchased it is not a difficult matter to construct the necessary artificially heated accommodation required during the early stages of rearing. Two suitable types of small brooder are described and illustrated at the end of this article. Late summer and early autumn hatching is likely to be conducted on a much greater scale than usual next year, and ample supplies of chickens will probably be available at this period.

Notwithstanding shortages of certain materials, such as galvanized iron and wire netting, it should be possible for many persons to erect a poultry house of modest design from materials already on the property. Suitable accommodation, however, may be available already.

The Commencement

Some beginners set out with the impression that the more fowls they keep the better, but their chances of success would be much improved if they were to commence in a small way, learn the rudiments of poultry farming, and build up their flocks gradually on sound lines.

A small house, 8 to 10 feet square, will accommodate twelve to fifteen adult laying fowls without an outside run. If built 6 ft. 6 in. high in front, and 5 ft. 6 in. high at the

back, there will be sufficient height for work in the shed to be performed in comfort. The front of the house should be built up 2 ft. 6 in. from the floor, with solid material, such as asbestos cement sheets or galvanized iron, and the rest with wire netting. The roof may have an overhang in front of from 18 inches to 2 feet, and also a little at the back. It is preferable to have a concrete floor, as it is sanitary and permanent, and when covered with 4 to 6 inches of clean straw litter, risk of disease will be reduced. Removal of all litter at intervals of three months and replacement with new material will greatly help in preventing the occurrence of disease and parasitic infestation. The birds will keep in better health if confined to the house continuously, rather than if they are allowed to run on ground badly contaminated with worm eggs and disease-producing organisms. Rats may be prevented from burrowing and breeding under the concrete floor by the use of wire netting, iron, bricks or concrete placed 18 inches below the floor level all round the house. The house should be well ventilated, free from draughts and comfortable.

Another type of house is one with an area of approximately 16 feet by 8 feet, divided into two, one compartment for the new pullets added each year, and the other for the older birds. A house of this description will accommodate approximately ten or twelve birds in each compartment.

The houses should face north to allow the sun to reach the floors most of the day, especially during the colder parts of the year. Houses should face east only when exposed continually to bad weather.

For small houses the perches may be made of 2 x 1-in. or 2 x 1½-in. timber, with the 2-in. surface upward. The outer edges of the top surface should be slightly rounded off. Perches should be placed near the back of the house, all on the one level, 2 feet to 2 ft. 6 in. above the ground, 15 to 20 inches apart, allowing approximately 8 inches of perch room to each bird. It is advisable for the perches to be away from the walls, and supported from the roof by iron rods or wire; they should be so placed as to permit easy movement on their supports to that the joints may be treated at regular intervals with disinfectant. This will help in the control of red mite, the worst and most persistent pest that the poultry keeper has to deal with; these parasites hide in the crevices of the perches and surrounding woodwork in the day time and infest the birds at night. They must be destroyed if the birds are to have their proper rest and remain in good health. Porches should be free from cracks and preferably coated with tar.

Nests should be placed approximately 2 feet above the floor, and fixed so that they can be easily removed for cleaning. On commercial poultry farms, approximately one nest is provided for every eight birds, but for a small house it may be preferable to have one or two more.

Birds should be provided with a continuous supply of clean drinking water. Good types of automatic water systems may be obtained from the poultrymen's suppliers.

The measurements of the shed accommodation required for a large flock of laying fowls differ from those needed for a small flock. A popular type of shed for a large flock is one measuring 120 feet long by 20 feet deep, divided into sections 20 feet wide, approximately 8 feet high in front, and 6 feet high at the back. Four square feet of floor space is provided for each bird, and each compartment will hold 100 birds.

The breeds most commonly kept on Victorian poultry farms are those which have been specially developed for egg production. White Leghorns are kept in the largest numbers. The Australorp, classed as a "heavy" breed, and more suitable as a table bird than the White Leghorn, is the next most popular breed kept for egg production. Other breeds, with the exception of the Rhode Island Red, do not receive the same attention.

In establishing a flock, no matter how small, it is most important that all birds should be purchased from commercial poultry farmers who breed only from disease-free stock. When day-old chickens (pullets or mixed sexes) are purchased, it is necessary to have a brooder for rearing them until they can be moved out, and finally reared on open-range conditions. Chickens should have plenty of fresh air and sunlight from the commencement. It may be possible to purchase partly-grown pullets, ranging from four to eight weeks old, and in that case a good deal of the rearing difficulties would be avoided.

Rearing and Feeding Chickens

Clean, warm, well-ventilated, and comfortable quarters are essential immediately the chickens are removed from the incubator.

Fresh air, direct sunlight, freedom from excessive heat, cold, or draughts, ample room, and ease of cleaning are some of the important requirements if healthy chicks are to be reared.

One of the most frequent causes of failure and high mortality in rearing chickens is lack of proper sanitation. Brooder floors and runs, and food and water vessels frequently are allowed to become very dirty. It is important that these be cleaned continually, and also, that food and water be so placed that the chickens cannot walk into them. Dryness and strict hygiene are essential in the control of intestinal parasites, and direct sunlight is of great value as a disinfectant and preventative of rickets.

Chickens must not be left in the warm brooder too long. They should be transferred gradually to clean, open-range conditions, where they will receive fresh air, sunshine, and the freedom so essential for their best development.

Brooder houses should be reserved for chickens only. They should be cleaned and disinfected at the end of the season, and left vacant to prevent the introduction of disease in the following year. Some time before the chickens are hatched, the brooder should be cleaned and examined, and any necessary repairs made. It should also be put into operation to get it into working order some time before the chickens arrive.

Chickens must be fed on nutritious food right from the commencement. The ration should include foods rich in protein, and low in fibre; such foods include meatmeal, meat or milk and its products.

Food and water may be given about 24 hours after the chickens are hatched, but the amount eaten will be small during the first day or two. It makes little difference if they are not fed until 48 hours after hatching, but if feeding is delayed too long the chickens may become ravenously hungry, and eat too heavily at their first feed.

Poultry keepers in a small way may find it more convenient to use reliable commercially mixed foods rather than buy the ingredients, and mix their own.

There are many rations and feeding systems used by poultry farmers, and if good results are obtained there is no reason to change, but the following mash mixtures with cracked grain and greenstuff have given good results:—

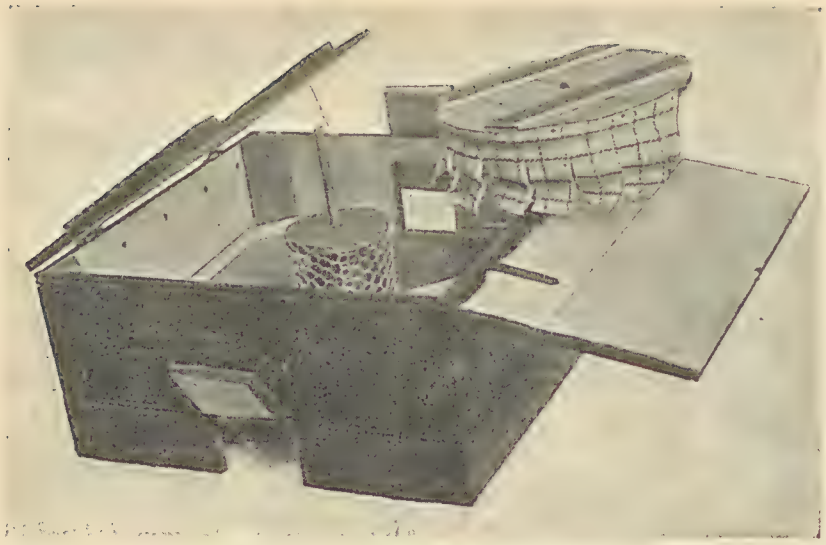
—	Mixture 1.	Mixture 2.	Mixture 3.
	lb.	lb.	lb.
Ground Wheat ..	40	30	50
Ground hulled oats	20	10	30
Ground Maize ..	20	40	..
Bran	10	10	10
Dried buttermilk ..	10	5	..
Meatmeal ..	..	5	10
Common salt ..	½	½	½

If desired, 3 lb. of bone meal, or 2 lb. of di-calcic phosphate may be added to the above mixtures. These mixtures can be given as a dry or wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash a couple of times a day. They can be fed from the first feed when the chicks are about a day old, until they reach maturity, or until well grown, and then the young birds can be fed on an adult ration. For the grain portion of the ration, 60 lb. of cracked wheat, 20 lb. cracked hulled oats, and 20 lb. cracked maize make a good mixture. Only a small amount of grain is fed at first, and the quantity gradually increased. When the chickens are about eight weeks old, the grain may be more coarsely cracked or fed whole. If maize is unprocurable, cracked and ground wheat and oats may be fed instead. Portions of the ground wheat and ground oats may be substituted with ground barley. Ground grains are more nutritious than the various by-product meals such as bran, pollard, &c.

Fine shell grit should be available in separate hoppers for the chickens.

It is important that the chickens should receive as much tender green feed as they can eat at least once a day. A liberal supply of fresh and clean drinking water should always be at hand. With proper management and a variety of plain, wholesome and nutritious foods, the chickens are usually provided with all the nourishment and vitamins necessary for their health and growth. The chickens should also be exposed to direct sunshine, as this is necessary for proper bone development and the prevention of rickets.

In the absence of greenstuff and exposure to direct sunshine, a reliable brand of cod liver oil, or oil rich in vitamins A and D, may be added to the mash as a vitamin supplement.



One type of home-made brooder.

If chickens are to do well it is important that they be bred from strong, vigorous, healthy stock. It should be remembered also that diseases, constitutional weaknesses, vices, &c, can be prevented by providing the chickens with comfortable quarters, clean floors and runs, proper heat and ventilation, outside exercise and sunshine, a correct diet with ample green feed, and regularity in management.

Home-made Brooders

To accommodate about 80 *chicks.*—Make a box 3 feet square by 1 foot deep, and hinge the top so that the chickens can be fed conveniently. A lamp chamber can be provided by placing the box on a frame 3 feet square by 6 inches deep. An opening about 6 inches square should be made in one side of this frame so that the lamp can be attended to.

A hole is required in the centre of the floor of the box, and into this hole an inverted flower-pot should be fitted. Some material such as asbestos putty should be used to close up the space between the flower-pot and the floor, so as to prevent any fumes from the lamp passing into the brooder.

A small pipe is attached to the hole in the flower-pot; this pipe must be long enough to carry the fumes out through the top of the box. The possibility of poison fumes entering the brooder must always be guarded against. The brooder lamp, which should have a $\frac{5}{8}$-in. or $\frac{3}{4}$-in. wick, is placed directly under the flower-pot.

A piece of wire gauze should be put round the pot to prevent the chickens getting burnt. A round wooden cover about 20 inches in diameter, with strips of flannel tacked around the outside, placed over the pot, helps to retain the heat.

Ventilation should be provided by boring a number of holes around the top of the brooder close to the lid.

Another Type.

The second brooder illustrated is made in three sections; this makes for convenience in cleaning.

No. 1—the lamp chamber—is a frame 3 feet square, and about 9 inches deep. An opening about 6 inches square should be made in one side so that the lamp may be attended to.

No. 2—the heating chamber—is a frame 3 feet square and 3 inches deep, with a sheet of plain iron tacked on each side. A hole 8 inches in diameter is cut out of the centre of the bottom sheet, and the 8-in. disc is fastened with hoop-iron $1\frac{1}{2}$ inches above this hole. The brooder lamp, which should have a $\frac{5}{8}$-in. or $\frac{3}{4}$-in. wick, is placed directly under the hole. The heat of the lamp goes through the hole, and strikes on the disc, and is distributed throughout the heating chamber, and thus warms the top sheet of iron more evenly. A piece of bag covered with dry sand is placed over the top sheet of iron which forms the floor of the brooder.

No. 3—the brooder chamber—is 3 feet square and 9 inches deep, and is like a box without a bottom. It fits neatly over No. 2. Plenty of ventilation is provided in the top of the brooder by fitting in a small wire netting frame, which can be removed when the chicks require attention.

Providing a Run for the Chicks.

When using brooders of this type, it is advisable to provide a small run for the chicks for the first few days. The run can be made from a shallow box about 3 feet square and 1 foot deep, with the top and one end removed. It should be placed against the brooder so that the floor of the run will be level with the floor of the brooding chamber. This contrivance

will prevent the chicks from getting too far away from the brooder, and there should be no difficulty in teaching them to go to and from the heat as they require it. The chicks should always be fed and watered in the run, and not in the brooding chamber. After seven or eight days the small run can be removed and replaced by a ramp which will allow the chicks to get down to the ground. In fine weather they should be given access to a nice green run, and also to the sunlight, as direct sunlight (not through glass) has a very beneficial effect on growing chicks.

Feeding Poultry for Egg Production

A high yield of first quality eggs is the result of systematic culling and breeding from suitable birds, a comfortable healthy environment, and correct feeding.

It has been shown in feeding experiments and on commercial poultry farms that fowls will lay well when fed on many different kinds of foods. From the view-point of economy, however, which must be observed on every poultry farm, it is essential that the ration consist of a suitable variety of food of good quality, properly balanced, and that the cost be reduced as much as possible.

A variety of foods is necessary to increase palatability of the diet and to maintain bodily health. If palatability is increased the consumption of food is increased, and this increases the production of eggs, for it is only the food left after the maintenance demand is satisfied that is available for egg production.

A properly balanced ration furnishes the necessary constituents in such amounts and proportions as are necessary to maintain the bird in good health and for high egg production. The foods fed to poultry consist chiefly of cereals, cereal by-products, green foods, and by-products of plant and animal origin. A high percentage of protein is contained in meat meal and dried buttermilk, &c., while such foods as cereals are much lower in protein but contain a high percentage of starch.

Rations.

The following rations, suitable for egg production are suggested by the Department of Agriculture. The amounts and the ingredients may be varied to some extent, according to the cost or the availability of the foods, but it is undesirable to decrease the proportion of protein supplements, such as meatmeal. Crushed wheat has been largely used when there has been a shortage of bran and pollard.

Mash.

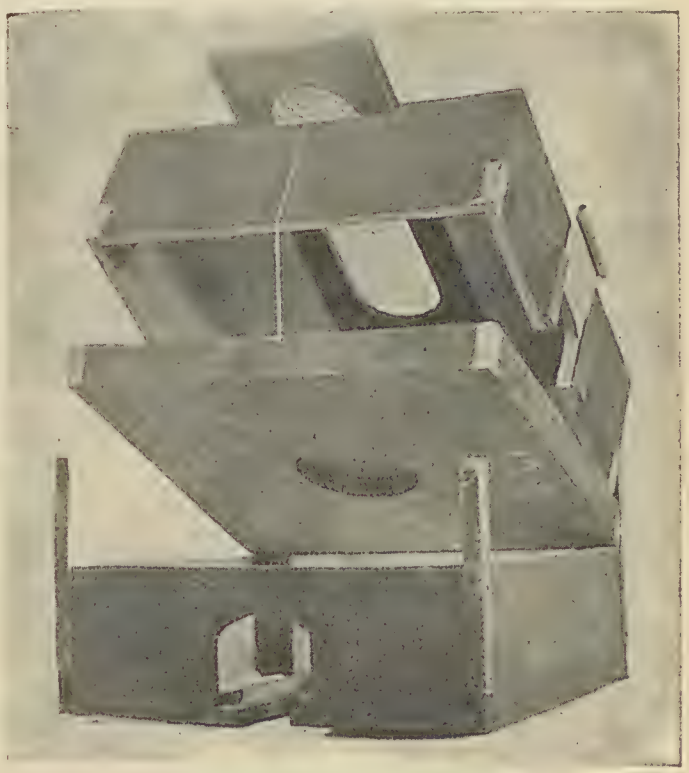
Bran	30 lb.
Wheat pollard	50 lb.
Maize meal, oat pollard, or barley meal	10 lb.
Meat meal or dried buttermilk	10 lb.
or meat meal	5 lb.
Dried buttermilk	5 lb.

Grain.

The grain ration is fed in the litter in the evening, and this can be used with either the wet or dry mash system.

Wheat	60 lb.
Oats or barley	20 lb.
Maize	20 lb.

As a dry mash the meal foods are mixed together and fed in hoppers to which the birds have access at all times. Chaffed green food



Another type of brooder.

is fed separately. When used as a wet mash the ration may be mixed as follows:—

The bran and meat meal are mixed together, then moistened with the liquid to be used, dried off with the pollard and other fine meals, and approximately 25 per cent. of chaffed green food is then added, the whole being formed into a nice crumbly mash. This is fed regularly each morning in clean troughs. Some chaffed green food may be fed separately. If cooked meat, such as bullocks' heads, livers, &c., is used in place of meat meal or dried buttermilk, the mash should be mixed with the soup. A little less than one-third of an ounce of the cooked meat should be allowed per bird per day, or approximately 2 ounces per week.

Table salt may be added to either the wet or dry mash in the proportion of ½ to 1 lb. for every 100 lb. of mash, weighed dry. This amount should not be exceeded, and care should be taken to allow for any salt present in other ingredients of the ration. The fine salt for stock purposes is cheaper than the household variety. The salt should be thoroughly mixed through the dry mash, and for the wet mash it should be properly dissolved in the liquid or soup with which the mash is to be made, to ensure an even distribution.

Shell grit should always be available, and a liberal supply of pure cool water should be kept constantly before the birds. Strict attention to cleanliness in the use of food and water vessels is essential in order to keep the birds in perfect health.

The amount of food supplied to each bird daily must be determined by experience, as no hard-and-fast rule can be laid down. For egg production it is advisable to give the birds as much as they will comfortably eat without waste. The amount varies according to the time of the year, and more food is eaten during the period of high egg production than when egg production is low. During egg production each bird consumes approximately 2 oz. of grain and 2 oz. of mash per day.

Wet or Dry Mash.

The question is frequently raised whether the dry mash or wet mash system is the better for egg production. Each system has proved highly satisfactory in official egg-laying competitions and on commercial poultry farms. Some of the larger farms, however, feed wet mash when fresh meat, &c., can be purchased in a large way. There is no doubt that a good wet mash, well mixed, is very palatable. On the other hand, the dry mash system saves much labour, and is a simple and clean method of feeding. Sometimes both systems have been used together, under certain circumstances, as a change of food or to increase the amount of food eaten.

Green Food.

The value of fresh, succulent, tender, green food for poultry can hardly be exaggerated; it is, indeed, a necessity on every poultry farm, and a continuous and varied supply must be provided if good health of the birds is to be maintained. This foodstuff may be supplied at midday or following the grain ration at night. A regular, plentiful supply of fresh greens is the common method of supplying vitamin A, the growth promotion vitamin to poultry. Not less than 5 to 6 lb. of chaffed green food should be provided for every 100 adult birds daily. Green food should be fed only when it is young, as fibre to poultry is practically indigestible. Some of the best green foods are barley, oats, maize, silver beet, rape, mustard, lucerne, berseem, lettuce, millet, grass, chou moullier, cabbage and cauliflower leaves.

Quality.

The public demand is for good flavoured eggs with a richly-coloured yolk. If the foods used consist chiefly of wheat, oats, barley and milk products, the yolk will be a pale yellowish or whitish colour, whereas if foods such as greenstuffs, yellow maize, &c., are fed in addition, the yolk will be a rich yellow or orange colour.

The book *Poultry Farming*, published by the Department of Agriculture, contains further information on all phases of the industry, and may be obtained upon application to the Director, Department of Agriculture, Melbourne, C.2, for the sum of 2s. 6d., which includes postage.

It's Your Job!——Stop That Rumour!

Let's Keep the Pig Industry in its Proper Perspective

By L. A. DOWNEY, H.D.A., Pig Expert

Our war effort demands more and bigger pigs.

THE changes in the pig industry caused by war conditions, and particularly by the present imperative demand for increased production, are likely to give pig-raisers a wrong conception of the economics of their industry and of its place in the whole agricultural economy.

Pigs serve mankind best when they are used to salvage waste and to utilize by-products and surpluses from other agricultural and food industries. Wheat may be fed to pigs because it is not of sufficiently good quality for milling; or when it is milled for flour, the offals, pollard and bran, may be fed to pigs. Again, when the supply of millable wheat exceeds the demand for flour, the surplus wheat may be used for pig feeding, provided its price is favorably related to the price of pigs. In the absence of more remunerative markets separated milk may be put to good use in pig feeding.

Generally, the most economical pig raising is where waste or by-products are fed to pigs on the farm where they occur, and this type of pig raising should be developed to the fullest extent at all times. Unfortunately, on many farms including market gardens and orchards, no pigs are kept to salvage waste and return fertilizer to the soil.

The expansion of the policy of a few pigs on every farm should make a material contribution to individual farm incomes and to the pig industry as a whole.

When pigs are fed mainly on waste products it is difficult to calculate the cost of pig production, but when purchased foodstuffs comprise the major part of their diet it is possible to calculate the production cost reasonably accurately, and it is then found that food cost forms the greater part of the total cost of production.

Pig production costs vary considerably as between pigs, between farms, between districts and between seasons. If it were possible at any time to calculate the average cost incurred by all pig-raisers in the State in producing a pound of pork, we would find many whose costs were above the average and many whose costs

were below the average and few whose costs actually equalled the average. With such a big variation in production costs there must necessarily be a big variation in net returns, because selling prices are not related to individual production costs; therefore, when some pig-raisers are making a profit others may be incurring a loss. Those who suffer loss either decrease their pig-raising enterprise or continue in the hope that conditions will improve and their loss will change to a profit. If too many pig-raisers are not making a profit and as a result reduce their production, the demand for pig meats overtakes the supply, pig prices rise, and increased production is encouraged. At least, that was the way of it before introduction of the Pig Meat Acquisition Plan as part of a controlled agricultural economy.

The Commonwealth Government's aim in the Pig Meat Acquisition Plan was to reduce the fluctuation of pig production and values caused directly by the changes of supply and demand, and to encourage stable production of pigs. To achieve this objective the Government guaranteed fixed prices for pigs over a certain period, under certain conditions. In fixing a price for pigs produced at varying costs, any determined price must necessarily give a greater net return to some pig raisers than to others. If the fixed price were sufficient to encourage those producers whose costs were equal to the average of all producers' costs, it would be very attractive to those whose costs were below the average, but would reduce production by those whose costs were above the average, since the gambling element is eliminated, those high-cost producers would not continue in the hope of the position being corrected through the direct operation of the law of supply and demand.

What the fixed price should be under the plan is a very debatable question. The price must certainly be influenced by the quantity of production wanted, and it must bear some relation to production costs. Unfortunately there is little information available on actual production costs, and a wide variation of opinion on estimated costs.

When at first the price of 8d. per lb. was announced as the maximum for bacon pigs under the plan, many people thought that it was not high enough to encourage production. No doubt it would have been sufficiently high to keep farmers producing pigs on low-cost foods such as waste and by-products, but it would have deterred them from using substantial quantities of purchased pig foods such as grains at the then ruling prices, and it would have decreased, probably permanently, the production by high-cost pig-raisers

As war demands for increased quantites of pig meat became imperative, the prices for pigs determined under the Pig Meat Acquisition Plan were increased, the maximum prices for baconers being raised to 9d. per lb. It was contended that this price, together with the increase in the weight range of baconers to 200 lb. dressed, and the supply of wheat for pig feeding at concession rates, would so increase the margin of profit as to encourage maximum production from low-cost producers and would even keep the high-cost producers in the industry.

In view of past prices and conditions of the pig industry, such a contention was justifiable. Future conditions, of course, may necessitate a revision of prices, as in war time particularly it is impossible to forsee conditions a year or two ahead.

The present conditions of pig prices and food supplies and prices are the most favorable the pig industry has ever experienced, and increased production to the limit of capacity is expected. This is an effect of war, and it means that maximum production is required with little regard to cost. As a war-time emergency this is alright, but it must be regarded as a future danger when competition with other meat industries and with other pig-producing countries has to be faced. Efficiency then will assume more importance than it does at present.

There will not always be a surplus of wheat which the Government can supply at a subsidized price and at concession freight rates for pig feeding, and therefore pig-raising must be developed as far as practicable on the use of waste and by-products, to enable a substantial part of our pig meat to be produced at a cost not much above that of other meats produced on pasture, which is the cheapest stock food, but has only a limited use in pig nutrition.

There is a demand that must be met for an immediate increase of at least 25 per cent., and as much more as possible, in Australia's output of pig meat.

The pig is an accommodating animal in the hands of the skilled farmer, and farmers have been offered the incentive in the form of guaranteed prices ranging up to £7 10s. a head for bacon pigs and a maximum price of 3s. 6¾d. per bushel for wheat for pig feeding in truck lots delivered to the purchaser's railway siding anywhere.

Every dairy farmer with pigs should feed wheat or pollard in greater quantities than ever before. In the past about ¼ lb. of cereal meals has been fed to pigs for every gallon of separated milk fed, whereas 6 to 7 lb. of cereal grains or meals can be fed with each gallon of separated milk and still comply with nutritional requirements, and this rate of meal feeding will be profitable with the present prices of grain and pigs.

Wheat growers with pigs should use the maximum of grain and the minimum of separated milk or meatmeal. Self-feeders should be used to save labour.

Those many farmers who do not keep pigs should consider ways of using pigs to salvage waste on their farms and to return plant foods to their soil. Our slogan should be, "A few pigs on every farm."

To make the best use of the available pigs, foods, labour, equipment and transport, pigs should be grown to heavier weights. In most cases it will be advantageous to hold pigs a fortnight or a month after they would normally have been sold for slaughter, but in the case of pigs becoming excessively fat, the diet should be restricted during the extended feeding period.

Small-type breeding stock should be replaced by larger-type pigs, whose progeny are capable of rapid growth to heavy baconer weights without becoming excessively fat.

Those are measures recommended to meet the present emergency needs.

To help the immediate requirements and to put the pig industry in a sound position to meet less favorable conditions which the future may bring, every practicable measure should be taken to reduce waste in pig production. Waste is incurred through the occurrence of litters which are small in numbers or light in individual pig weights and by slow growth to bacon weight. Such waste can be reduced by skilled pig husbandry which includes the use of superior breeding stock, proper feeding methods, sanitary accommodation, and measures to control internal and skin parasites of pigs. The Department of Agriculture is able and willing to advise farmers on the technical aspects of pig production.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Abrahams, L. J. ..	Red Hill South	Haywood, Dr. A. R. ..	Hastings
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Noble, T. M., and Sons ..	Maffra
Castle, L. H.	Clarinda	Northcote Children's Farm	Bacchus Marsh
Critten, H. S.	Dumbalk	Pietsch, R. E.	Katyil
Dookie Agricultural College	Dookie	Rintoul, J. T. C. ..	Glengarry
Doornbusch, John L. ..	"Starpark," Nhill	Roy, W. A.	Morrell's Hill, via Boolarra
Ellwood, A. H. ..	Paschendaele	State Experiment Farm ..	Rutherglen
Fairchild and Clutterbuck	Tinamba	Trenery and Soderlund ..	"Promview," Foster
Hamblin, A. T., and Sons	Toolleen	Trigg, A. J.	Bungaree
Harrison, C. T... ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
Hawtin, I. E. and F. ..	"Rossmoyne," Colac	Tweddle, J. T.	"Winlaton," Shepparton
		Whelpton, B.	Whittlesea North

VACCINATION OF SHEEP

By THE VETERINARY STAFF

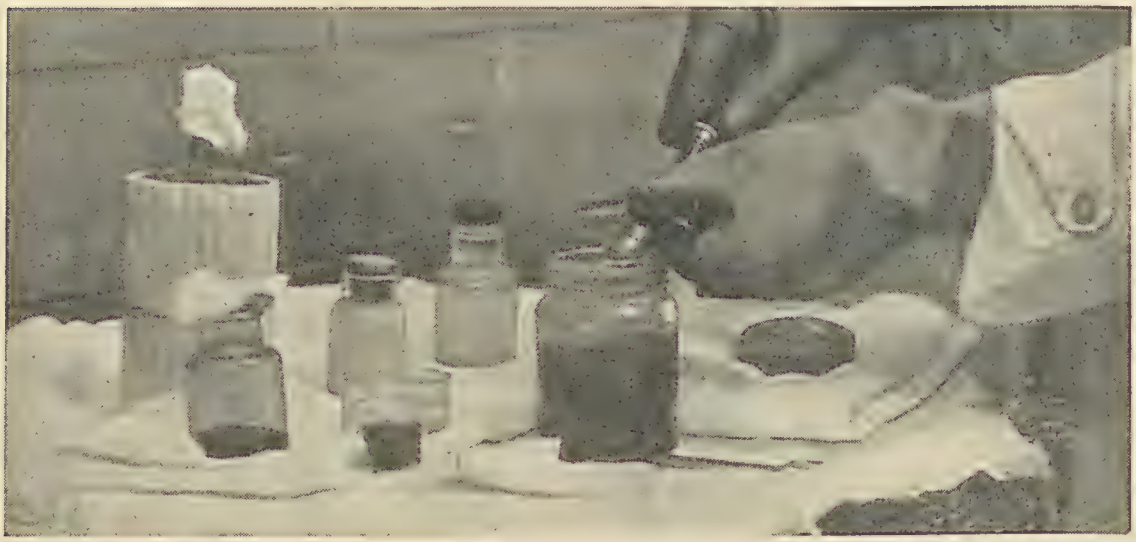


Fig. 1.—Apparatus required for sheep vaccination set out ready for use.

INSTRUCTIONS for the vaccination of sheep against Black Disease, and of sheep or lambs against Entero-toxaemia (Pulpy Kidney) are set out in the following article.

Vaccination should be carried out in the shearing shed, the floor of which must be swept clean. The only exception to this is made in the case of young lambs being given the first dose of vaccine against entero-toxaemia at the time they are marked. In such cases it is advised that extra precautions be taken against dust and flies, and further, the person doing the vaccinating should do nothing else.

Materials

A small table, large box, or 40-gallon petrol drum, on which to set out the instruments, &c., is placed in a convenient position close to the catching pens, and should be nailed to the floor or tied securely. Where there are two catching pens with a space between the doors, this space is the most convenient place for the table. Greater speed can be attained with the table in this position, as one step will bring the operator to the sheep brought out from either pen.

Two glass jars each of about 10-oz. capacity with screw-on lids; three 2-oz. wide-mouthed bottles; one small flat dish; a 10 c.c. glass-barrelled syringe and spare barrel; three push-on needles, No. 18 gauge; pair small pliers; scissors, rubber gloves (household variety); roll of cotton-wool; 5 oz. tincture of iodine per 1,000 sheep, and a small bottle each of methylated spirit and of formalin, are required. An aluminium saucepan should be kept solely for the purpose of sterilizing the syringe and vaccine jar. It is desirable that all the apparatus be kept together in a box when not in use: for this purpose nothing is better than a fibre attache case, the cost of which is very small.

Sterilization of Syringe and Vaccine Jar.—The syringe should be sterilized by boiling for ten minutes: the piston is removed from the barrel and the two parts are placed in a saucepan of clean, cold, or lukewarm water which is then boiled for ten minutes, at least.

The syringe case is swabbed out with methylated spirit and the syringe lifted from the boiling water and placed in the case. The needles need not be boiled, but should be placed in spirit in the flat glass dish.

The vaccine jar and lid also should be boiled for ten minutes, and then wrapped in a sheet of note paper. This work may be done conveniently the evening before use.

Preparation

The table is covered with a clean cloth or towel. The three 2-oz. bottles are used for tincture of iodine, methylated spirit, and formalin, and the small flat dish is used to hold the needles which are covered with methylated spirit. In this way the needles are kept sterile, and the spare ones are available should the one in use need replacing.

Several small cotton-wool swabs about two inches square are cut, together with a single piece twelve inches by eight inches. The latter is folded to make a cover eight inches by six inches, between the fold of which the assembled syringe is placed whenever not actually in the hand. This wool also makes a suitable place on which to put the vaccine jar lid during filling of the syringe. Figure 1 shows the apparatus set out on the top of a petrol drum.

The operator now slips on the rubber gloves, which will go on quite easily if the inside of the gloves and the back of the hands are dusted with French chalk or talcum powder. The gloves are then swabbed over with spirit, which dries quickly: formalin would also sterilize the gloves, but leaves them slippery for some little time.

The syringe is assembled and a needle tightened on with the pliers, the jaws of which have been swabbed with methylated spirit. The vaccine container is shaken: the stopper eased slightly, and the top of the tin and stopper swabbed with formalin. The vaccine jar is filled (if doing large numbers of sheep the use of two jars will expedite the work). While filling the jar, the rubber stopper from the vaccine container should be placed on a small cotton-wool swab soaked in formalin, and the stopper after being replaced in the container should be covered by this same swab to prevent contamination by dust or flies.

Fig. 2.—Showing sheep held correctly for thigh inoculation.

Fig. 3.—Showing shorn sheep held in position for fore-leg vaccination. To enable the operation to be photographed the operator is standing more to one side than would normally be the case.

Care is needed in pouring the vaccine from a metal container. The can should be held with the opening uppermost, and the lip of the receptacle placed under the nozzle of the tin: the air in the top of the tin aids the slow pouring of the vaccine. If an attempt is made to pour from the full container in the usual manner, the vaccine will come out with force and be spilled.

Instructions to Catchers.

A few words to the men on the necessity for the operator to keep instruments and vaccine free from contamination is timely: the object being that the operator should refrain from touching any part of the sheep with his hands, and the men should avoid handling anything on the table.

For Thigh Inoculation.

Two catchers are used for each pen, and with four sheep out on the board, instructions in the method of holding are important. The catchers turn the sheep over in the pen, and walking out backwards swing the sheep slightly towards the operator: the first catcher from each pen places his sheep over near the chute while the No. 2 catchers draw up alongside and slightly behind. The operator coming over to the right as he turns round inoculates in the left thigh of the sheep on his right, and in the right thigh of those on his left.

The front leg of the side in which the inoculation takes place is held with the hand furthest from the operator, i.e., two catchers hold the left front leg with the right hand, and the other two hold the right front leg with the left hand. The other hand is then brought down with the thumb held close to the fingers, and placed just above the stifle joint; at the same time holding away the fringe of wool present along the flank. There should be no tension on the skin of the thigh.

The head of the sheep must be kept up, and the animal should be sitting evenly on its rump, leaning back sufficiently to expose a maximum amount of the bare skin of the inner aspect of the thigh. See Fig. 2. Kicking rarely takes place if the sheep is placed evenly with head up: should it draw its leg up or kick, the catcher's hand is in position to press above the stifle to straighten and hold the leg. With sheep held in this way, the operator has a chance to choose a clean area in which to inoculate, and with the flank fold of skin and its fringe of wool held away, the syringe does not come in contact with any part of the sheep. As soon as the dose of vaccine is injected a forward thrust from the catcher heads the sheep straight for the chute opening.

A warning should be issued to the men against the tendency, with some, to spread out the thumb and place it along the junction of the thigh and the abdomen: when this is done, the thumb comes in the way of the needle, and in endeavouring to avoid pricking the catcher, time is lost.

For Arm Inoculation.

If the operator prefers to inoculate inside the arm instead of inside the thigh, the sheep are brought out on to the floor in the same manner, being held by the front legs. In sheep with little wool, sufficient bare skin is exposed to allow the inoculation to be carried out without extra assistance from the catcher, but with sheep in the wool the catcher uses one hand to hold away any fringe of wool in order to expose a good field for the operation. Fig. 3 shows a fore-leg inoculation position. For the purpose of the photograph the operator had to stand more to the side then he would in actual practice.

Inoculation of Ewes.

When heavy in lamb, ewes may be vaccinated in a drafting race. Here the inoculation can be made without such handling of the ewe as may be necessary when the injection is made into the arm or thigh.

The ewes are run in and the race is filled. Undue crushing of the ewes should be avoided. The operator and his assistant work outside, along the length of the race. They lean over from the outside and inoculate each sheep as they come to it.

The most suitable site for injection is just behind the shoulder. A minimum of handling is necessary, because the ewes will stand on all four limbs practically unrestrained. The wool behind the shoulder is parted and the exposed area of skin is cleansed with methylated spirit.

With the barrel held more or less parallel to the body of the ewe, the needle is inserted obliquely through the skin into the subcutaneous tissue and the required dose injected. After the inoculation of the ewes in the race is completed, the syringe is rinsed out with methylated spirit and the next batch of ewes is driven into the race.

Fig. 4.—Inoculation of sheep at inner aspect of thigh.

Fig. 5.—Inoculation under the arm.

By this method, sitting the sheep on its rump, an undesirable practice in advanced cases of pregnancy, is avoided.

Inoculation

Before beginning to inoculate, the operator should make himself familiar with the divisions marked on the barrel of the syringe so that he will know just how far to press the piston to inject either 2 c.c. or 5 c.c. doses.

After the syringe is filled, the lid should be replaced on the jar to prevent contamination by flies and dust: a swab well-soaked in iodine is dabbed on the bare skin forcibly, and the needle is introduced just through the skin. The object is to inject the dose under the skin and to avoid placing it in the deeper tissues. With a little practice it will be found that it is unnecessary to hold the skin while introducing the needle, and as the needle penetrates the skin the piston is pressed by the thumb until the dose of vaccine is injected. Fig. 4 shows the needle entering the thin skin of the thigh, and the thumb ready to press on the piston, while Fig. 5 shows the needle entering the skin under the arm: the operator's hand being lowered to allow this to be seen.

While moving back to the table to refill the syringe, the needle should be wiped through a channel of the iodine swab formed by turning over the corner nearest the palm of the hand: this part of the swab does not come in contact with the skin of the sheep. While the operator is refilling the syringe, the catchers should have fresh sheep out on the floor ready to be inoculated.

Use of Antiseptics

Methylated spirit and formalin are used for antiseptic purposes. At each recess, about 2 c.cs. of formalin should be drawn up into the syringe to rinse it: this is discarded, then another small quantity drawn-up and left in the syringe. The outside should be swabbed over with spirit and the syringe placed under the fold of cotton-wool kept for that purpose. Before being used again, the formalin in the syringe is ejected.

At intervals during the work the rubber gloves should be swabbed over with spirit. Should a needle loosen and fall off the syringe, it will be found advantageous to take a fresh one from the spirit to avoid delay. During a recess the soiled needle can be cleaned and placed in the dish of spirit.

Care of Vaccine

The vaccine against either black disease or entero-toxaemia in unopened containers should be stored in a cool dark place until required for use.

Vaccine should be ordered in quantities that will allow the contents of a container to be used in any one day. Any residue in the container should not be stored away for future use after the tin or bottle has been opened.

Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hospital	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East	154
Ballarat Orphanage	Ballarat	135	Northcote Children's Farm	Bacchus Marsh	156
Banyule Stud Pty. Ltd.	Wangaratta	31	Onley, W. H.	"Glenholme," Caldermeade	55
Black, I. S., Estate	Mount Noorat	53	Parker, Mrs. L. M.	Tallarook	56
Clarke, A. B.	Glenormiston South	15	Payne, A. E. T.	"Yarra View," Lilydale	63
Dennis, Mrs. A. A.	Frankston	42	Payne, T. E. N.	"Woodburn," Kilmore	46
Dookie Agricultural College	Dookie	85	Poole, M. A. and D.	Caldermeade	134
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Poole, M. A. and D.	Yannathan	72
Geelong Grammar School	Corio	68	Powell, T. S.	"Carellen," Mansfield	46
Gibson, Mrs. C. S.	"Sweeney's," Eltham	35	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gorman, A. W.	"Cathcart," Alexandra	57	Samuel, Misses G. and E.	Lang Lang	48
Henry, J. A.	Warrnambool	41	School of Horticulture	Burnley	10
Hollaway, R. W.	Caldermeade	75	State Experiment Farm	Rutherglen	40
Kilmany Park Farm Home for Boys	Sale	104	State Research Farm	Werribee	220
Lawrence, P. H.	"Rainga," Tarrawarra	72	Tanner, N. J.	Pakenham	33
Longerenong Agricultural College	Dooen	43	Vagg, T. E.	Officedale	45
			Wells, W. G.	Caldermeade	63

In addition to the above-mentioned herds there are 246 commercial dairy herds containing 9,498 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 788 herds in which 15,050 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

THE food production programme which has been set by the Controller-General of Food calls for an increase of 25 per cent. in vegetables, 17 per cent. in milk, 16 per cent. in meat, and 12 per cent. in eggs. These increases are based on the estimated requirements of the services, civilians, and export trade, and it has been stated that any surplus over and above these requirements will be readily accepted.

Commercial producers of these products are classed in a very high priority, and every effort is being made to assist them. Live stock producers are receiving fixed guaranteed prices and subsidies which have made live stock farming remunerative. Feed wheat has been made available by the Commonwealth Government through the Australian Wheat Board at the reasonable price of 3s. 6d. per bushel in 1,000 bag lots and 3s. 6¾d. per bushel in truck lots at the purchaser's railway siding or on a Williamstown basis, whichever is the cheaper. This further concession in price by subsidizing the freight beyond Williamstown should be an incentive, particularly to pig and poultry farmers, to increase production.

Steps have already been taken to increase the production of flour, which will automatically increase the production of bran and pollard. For a long time, stock feeders have required greater quantities of bran and pollard, and it is anticipated that very shortly bran and pollard will be available in the same quantities as before the war. Stock feeders know the feeding values of these commodities, and an assurance that larger quantities will be readily available will be a further incentive to increase production.

Transport is the most recent difficulty to overcome, and, until such time as the position eases, farmers should endeavour to buy their requirements in truck loads and sell their produce at the nearest possible market or factory to relieve the pressure on the railways.

Townspeople can greatly assist in this drive for food production. Already, much has been said about backyard vegetable growing by officers of the Horticultural Division of this Department. Backyard poultry keeping can be expanded tremendously, and reference is made to this subject elsewhere in this issue of the *Journal*.

The number of house cows could be increased by thousands, and, in many cases, the calves could be reared into large vealers.

The rearing of orphan lambs by townspeople, particularly school children, would also contribute to increased meat production.

Dairy Cattle

In the food production programme a big increase in all kinds of dairy produce has been asked for to meet service, civilian, and export needs. An immediate increase in dairy produce is not always possible because stock have to be bred and reared, and stock food has to be produced for the extra dairy cattle, but much can be done if people set themselves seriously to the task. Possibly townspeople and other non-dairy farmers can do more to immediately increase the production of milk,

butter, cheese, and dried and condensed milk than the dairy farmers. This can be achieved by keeping house cows wherever room is available. Persons keeping house cows could produce all their milk, cream, and butter, and make the produce they normally buy available for export overseas.

Following a broadcast over the regional stations of the Australian Broadcasting Commission by Mr. J. Keane, B.Agr.Sc., of this Department, on a recent Sunday morning, a listener from Eldorado explained how he was keeping a house cow and assisting the war effort:—

"This morning I noted you remarks *re* the necessity for more meat production, and milk and butter production, and I thought you may be interested in what I am doing and endeavour to encourage others placed similarly to myself to do the same.

I am a salaried man working on an essential industry. The house I occupy is on a large block of land, as are most houses here, and each summer I had a fair quantity of grass which I cut and destroyed. When the meat and butter position became serious I decided, as a small contribution to the war effort, to purchase a heifer which most likely would have found its way to the butcher, raise it to production and put myself off the milk and butter market.

Actually I am in a position to purchase both commodities and save myself much effort, but I rented a vacant block and raised this heifer. I feel that, in most country towns, many salary and wage-earners could do the same, thereby increasing production without any increase of man power, also increasing the country's live stock. Recreation reserves could be turned into 'commons' for those who could not obtain a paddock.

I think that you will agree that my suggestion, if carried out, would help considerably, and, most likely, shire councils could be called in to organize a drive to that effect by making football and show grounds and recreation reserves available at a nominal charge per head for grazing, with the herdsman to look after the stock on days the grounds were required."

Sheep

November is a busy month for the sheep farmer. There is shearing to complete, dipping, culling, marketing of lambs and fat sheep, mating of ewes in the north and, where drought conditions prevail, the feeding and watering of flocks. Shearing has been delayed and will not be completed in many sheds until well into the new year.

Many owners will be shearing when they should be harvesting, and through lack of fodder conservation, the carrying capacity of their farms will be reduced. This is the more regrettable because it is occurring at a time when more mutton, lamb, and other live stock products are being called for by the Commonwealth Government.

The delay in shearing will add to the harvest labour problem, as shearers and shed hands will not be available for harvesting. This is likely to have serious repercussions on all the live stock industries. In all districts but the Upper Murray, fodder reserves are exhausted, and farmers will be dependent upon what is to be conserved this year for supplementary feeding during the autumn and winter, or during a subsequent drought.

Farmers are well advised to market all fat sheep as quickly as possible and to replace them where necessary with stores from areas faced with a short season.

Don't Rush the Store Pig Market

Instead of paying absurdly high prices for store pigs which are insufficient to meet the more abundant stock food supply, farmers are urged to hold their bacon pigs for another fortnight or month after they have reached marketable condition. The baconers should, of course, be kept on a restricted diet during the extra feeding period to prevent them becoming excessively fat. If this practice is adopted to the limit of the accommodation and other requisites available, the best possible use will be made of the available pigs and food, and there will be an early increase in the supply of pig meat which is urgently demanded by the nation.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry

The shortage of eggs during last autumn and winter, and a likely repetition of this shortage in the coming months, will encourage many householders to keep a few fowls to make them independent of outside supplies. With careful management and feeding, a few hens will supply the average household requirements.

In many cases accommodation for the birds may be simply and cheaply constructed by the householder from materials available on the property. Further advice on this subject is supplied in an article published elsewhere in this *Journal*.

The attention of small poultry keepers is drawn to the National Security (Egg Industry) Regulations and the Regulations of the Egg and Egg Pulp Marketing Board.

The National Security (Egg Industry) Regulations provide that all eggs, except those required for home use or those used for the purpose of increasing the flock, produced by owners of 20 or more adult female domesticated birds (fowls and ducks) must be delivered to the Controller of Egg Supplies or his authorized agents, unless a producer's selling permit has been granted.

In Clause 43 of the Egg and Egg Pulp Marketing Board Regulations it is provided that every producer of eggs who owns or controls twelve or more adult female domesticated fowls shall register with the Board within twenty-eight days of becoming a producer, giving his name and address, the number of adult female domesticated fowls owned or controlled by him, the names and addresses of the merchants, agents, or others to whom or through whom his eggs are normally sold.

Registration with the Egg and Egg Pulp Marketing Board is free, and persons with nineteen adult hens or less may sell their surplus eggs without any restriction.

The Deputy Egg Controller is the Chairman of the Egg and Egg Pulp Marketing Board of Victoria, and his address is 528 Collins-street, Melbourne.

[H. F. Clinton, Poultry Expert.]

Bees

In most districts west of Maryborough and St. Arnaud, colonies are exceedingly strong, attributable to the splendid autumn flow from sugar gums, stringy-bark, manna gum, and banksia, and the spring rains have put the ground flora in a condition to accelerate swarming.

A critical period will occur when the spring bloom has finished, as the prospects from the summer eucalypts are exceedingly poor, and colonies will have to be kept alive until the autumn flow begins.

Swarming will have to be checked, as new hive material is scarce, most apiarists being able to obtain only a small percentage of their requirements. All available comb space within the apiary will need to be utilized to the fullest extent. To adjust this, any weak colony not utilizing all its comb area can be placed upon the stand of a populous colony coming to swarming strength to receive its field bees. The populous colony can be placed on the stand of the weak one. The change over should be carried out when honey is coming in, preferably before noon on a good flying day. A watch should be kept for fighting, and if it occurs, a liberal dose of smoke should be applied.

It is essential that the weak colony be headed by a vigorous queen, as the change over would only result in a waste of bees if a worn-out queen were present, as she would be unable to maintain a brood area to conform to the additional cluster of bees received.

The hive of a parent colony that has already swarmed a week or so previously can also be used to take bees from very strong colonies when a shortage of material occurs. It will contain all sealed brood, and probably cells or a virgin queen. If the queen in the swarm is a valuable one, the cells or virgin queen can be destroyed, and the queen of the swarm caged, as for introducing.

If fighting takes place after the swarm has been run in, apply smoke as a prevention.

In maintaining a colony of bees over a lengthy period of dearth, it is advisable to supply the stores at one feeding. 10 lb. of feed given at one feeding will last over a longer period than if supplied in 2 lb. lots on five occasions. When given in small quantities the bees go into brood rearing and consume instead of conserving their stores. For spring or summer feeding, a mixture, two of water to one of sugar by volume, mixed hot and cooled off, can be given.

Empty combs can be taken from the colonies, filled with the syrup over a wash tub, then placed in a hive body and allowed to drain before being moved to the apiary. Combs can be readily filled if held at an angle of 45 degrees, and if the syrup is poured at a fair rate. A preserved fruit tin makes a good pourer.

The combs of syrup should be placed on the colonies at dusk, as, if given in the day-time, the bees excitedly rush out, and wholesale robbing is likely to commence with disastrous results.

[W. A. Collins, Apiary Inspector.]

[*Continued on page* 550.

War Agricultural Committee Notes

A Year's Operations

Compiled by
THE CENTRAL EXECUTIVE

THE month of October marked the first anniversary of the formation of the War Agricultural Committees in the State of Victoria. It was in August, 1942, that the Standing Committee of the Australian Agricultural Council decided to set up in each of the States, Committees to represent the farming community to assist the various State Departments of Agriculture in the direction, stimulation and control of agricultural production during the war.

Prior to Japan's entry into the war in December, 1941, Australia had been faced with the problem of disposal of many lines of surplus primary production, but with the necessity to meet the greatly increased food demands of the larger numbers of fighting forces in the South Pacific, the demand from Great Britain and civilian requirements a complete change in outlook was necessary. The drop in production of primary produce not only had to be stopped, but it was essential if we were to meet our obligations that it be very materially increased.

It was the early recognition of this fact that prompted the Standing Committee to decide to set up the War Agricultural Committees immediately to assist it in this important war work. These last twelve months have shown how urgent was the need to step up production and how necessary it was to take all possible steps to achieve that end. A short review of what has been done in the past year should therefore be of general interest.

In Victoria the problem of staffing and organizing the new organization was a serious one, since it was necessary to transfer 17 officers from their normal duties to full-time duty with the War Agricultural Committees. These were appointed as members of the Central Executive and as Chairmen and Organizers of the District Committees. In addition arrangements were made for other Agricultural and Lands Department Officers to assist as Chairmen for the Local Committees.

Nominations were then obtained from the many primary producers' organizations and Shire Councils and the members of the various District and Local Committees were appointed. To date in this State, 18 District Committees and over 200 Local Advisory Committees have been formed.

At their initiation, the activities of the War Agricultural Committees were directed mainly towards assisting with the manpower problem. The loss at July, 1942, of men from rural industries in Victoria was estimated at about 35 per cent. of the permanent labour and some 50 per cent. of seasonal labour existing prior to the war. The "ring fence" placed around rural workers by the Manpower Directorate in May, 1942, helped largely to prevent any further drift away from primary production, but the earlier losses had reduced rural manpower to a critical position.

The first of the Committees' tasks then was the study of the manpower requirements of their district for the coming harvest and the organization of the available labour in the best possible manner. Where possible this was done through existing industry organizations, and farmers were asked to register their requirements and the period for which labour was needed. These were then forwarded to manpower authorities who organized the supply of the necessary labour. The final allocation of the labour forwarded by the Manpower Directorate to the individual farmers in some districts was a major problem, the extent of which may be gauged by the fact that in the Mildura district alone last season over 2,500 individuals were directed for the dried fruit harvest while about 1,500 were similarly directed to the Goulburn Valley.

Great assistance in overcoming harvest labour difficulties was also obtained from the organization of week-end and holiday volunteers. In the larger country towns of Geelong, Bendigo, Horsham, Wangaratta and Benalla, groups of volunteers, often numbering over 100,

were organized each week-end by the War Committees, transport was arranged, and a very material contribution made to solving the harvest labour problem.

Criticism has frequently been voiced that rural labour is not being used to its full capacity. It is generally recognized that there are periods of six to eight weeks on a number of farms where work is not pressing, and during which employees might be used in other districts where they may be needed. A survey of all rural men in Military Classes I. and II. therefore, is being conducted in conjunction with the Manpower Directorate. In this survey some 20,000 men will be interviewed to ascertain periods in which they can be spared from their farms without decreasing production. This pool of available labour will form the Rural Workers' Pool, and will go a long way to solving some of the seasonal labour difficulties in the coming season.

Recently the more effective use of aliens and prisoners of war has been undertaken in vegetable and dairying districts of the State. Where possible these are being allocated in groups of one to three to farmers in approved districts, but attempts are also now being made to use them in a gang system from central camps.

With the present available labour well organized, the War Committees will now turn their activities to placing the 15,000 men released from the Army and Munitions to the best advantage.

Closely allied to the harvest labour problem has been the difficulty of providing suitable accommodation. In the past itinerant labour, which provided its own camping and cooking facilities, has been customary in many rural districts. This class of worker no longer exists, and with "direction" of labour, it has been necessary for farmers to provide adequate and suitable accommodation. Shortage of materials and labour have accentuated the problem and the War Committees have had to assist farmers in this direction At Mildura, Swan Hill, and Bendigo officers were made available to aid farmers with plans and materials for suitable housing on their own blocks, while at Shepparton, where special difficulties occurred, the erection of central organized camps was undertaken to provide accommodation for some 800 to 900 of the workers in that district.

One of their most important contributions to the production programme was made by the Committees during the first few months of their existence. With the very satisfactory season experienced last spring in the North-eastern and Gippsland districts, growth of grass was most prolific. With memories of past droughts and the likelihood of the future labour position becoming worse, it was realized that it was essential to conserve as much as possible of the surplus growth as grass hay. An intensive campaign was launched by the Committees, but difficulties were immediately experienced in manning baling presses and obtaining adequate supplies of baling wire. Contractors co-operated with the Committees in organizing a zoning system so that available machines and staff were used to their maximum capacity, while the assistance of the Commonwealth Controlling Authorities was sought for priority of supply of the necessary quantities of baling wire. As a result of their endeavours, over 700 tons of wire was delivered to Victoria (500 of which was used in the baling of grass hay) compared with a normal import of between 200 and 300 tons. The conservation of that extra grass hay last year has been a godsend to many a farmer and grazier during the past lean autumn and winter.

With the multiplicity of "controls" of all kinds of farm requirements and materials, the utmost difficulty is experienced in obtaining essential needs and production frequently suffers. The War Agricultural Committees have served one of their most useful functions in assisting farmers in lining up the correct method and body to approach for the release of the essential part. A list of these was published in the last issue of this Journal.

In regard to some of the materials in very short supply the Committees have played a more direct part. The Commonwealth Authorities have now come to recognize that the War Agricultural Committees are reliable bodies which can indicate to them the essentiality of any particular farmer's application, and accordingly they are using them to a greater degree. Permits for the erection of farm buildings, for the purchase of fibro-cement sheeting, for release of tractor tyres are only a few cases where the War Committees are now required to certify to all applications before the appropriate Department will grant a release. The local committee by virtue of its detailed knowledge of each individual in its district is able to rapidly and accurately sum up each application and so enable the controlling authorities to obtain an appreciation of the true facts.

With shortages of manpower inevitable, the only practical solution to the stepping up of production lies in mechanization on a large scale. Agricultural machinery, therefore, is vital to the food programme. For this reason the "control" in this case is vested in the Department of Commerce and Agriculture, and the War Agricultural Committees act as the State Authority in Victoria. The scope and operation of this control are too involved to be included in this review, and will be given in more detail in a subsequent issue of the Journal.

The question of control of ammunition is also one which by virtue of its effect on control of vermin vitally affects production. This also is under direct joint control of the police authorities and the War Committee and will be explained in detail in a later issue.

And so, in the first twelve months of their operation, the War Agricultural Committees have played an important part in organizing primary production to overcome the inevitable difficulties and shortages that must be associated with war, and to maintain and increase the production of those commodities vital to the Nation's war effort.

Fencing Material

The list of fencing materials has lately been amended, and now reads as follows:—

(*a*) Steel posts, 5 ft. 6 in. long—only to be made available to renew boundary fences destroyed by bushfire or flood.

(*b*) Barbed wire, 12½ gauge.

(*c*) Plain wire, 10 gauge—12½ gauge high tensile.

(*d*) Wire netting—

12 in. x 1½ in. x 17 in., available in 100-yd. rolls.

42 in. x 1½ in. x 17 in., available in 100-yd. rolls.

36 in. x 1½ in. x 17 in., available in 100-yd. rolls.

36 in. x 2 in. x 17 in., available in 50-yd. rolls.

72 in. x 2 in. x 17 in., available in 50-yd. rolls.

(*e*) Pig fencing—ringlock high tensile (8 wire x 30 in.).

JOIN OR FORM A WAR SAVINGS CERTIFICATE GROUP

LIVE STOCK NOTES—*continued from page 547.*

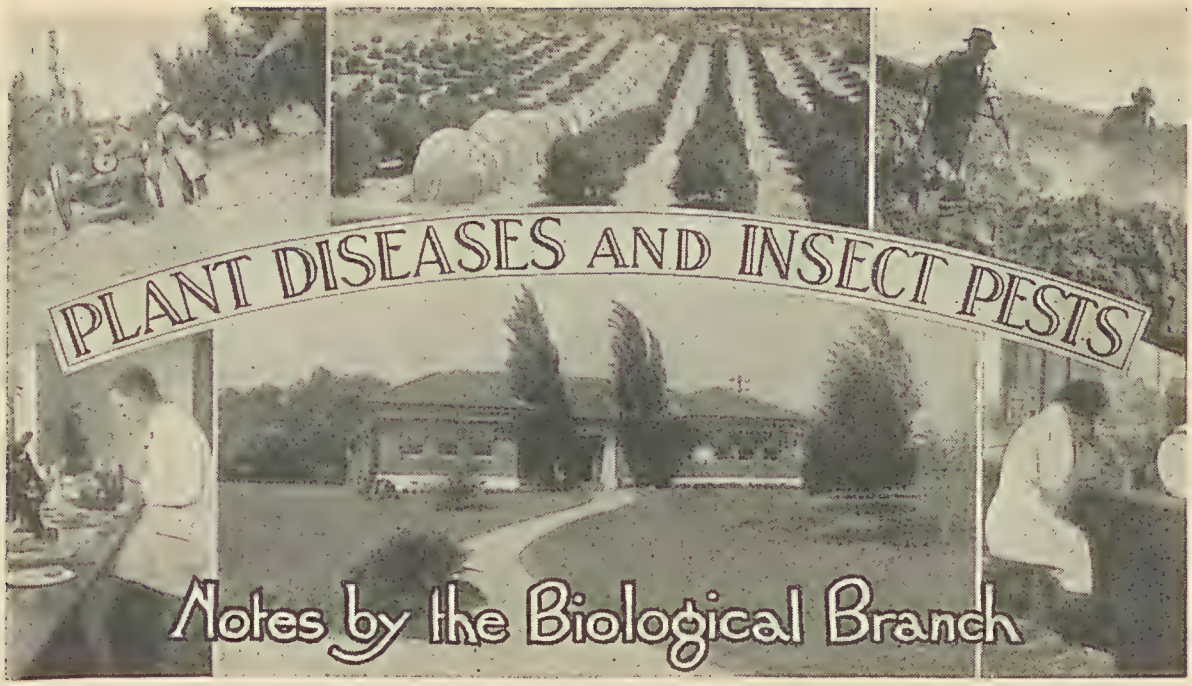
Bees Acts

AMENDMENT OF REGULATIONS.

The Regulation under the Bees Acts, which provides that the owner of any beehives shall legibly mark all such beehives with his name and permanent address in letters of not less than three-quarters of an inch in height, was amended on the 1st September, 1943, to provide that the hives may be marked with a brand which will be allotted by the Chief Veterinary Officer, on application.

The Regulation as amended now reads.—"On and after the first day of June, 1943, the owner of any beehives shall legibly mark all such beehives with his name and permanent address in plain letters not less than three-quarters of an inch in height, or with a brand allotted by the Chief Veterinary Officer of the Department of Agriculture. This Regulation shall not apply to any hives kept at the permanent address of the owner of such hives. For the purpose of this Regulation 'owner' includes 'lessee'".

It is desired to emphasize that the Regulation does not apply to hives kept on the owner's property.



"ANTHRACNOSE" OF BROAD BEANS

During the 1942-43 season an inspection of vegetable seed crops throughout the State revealed a particularly heavy infection of "anthracnose" in broad bean seed crops. The disease was at first confused with the true anthracnose of French beans (*Colletotrichum lindemuthianum*) as the symptoms of the two diseases are somewhat similar. However, the fungus responsible for the disease was eventually isolated and identified as *Ascochyta* sp. (probably *Aschochyta fabae*). This disease was particularly serious in the Geelong district, where many broad bean seed crops were infected. Some crops at Leopold, Wallington, and Drysdale were 100 per cent. infected.

Symptoms

Dark brown circular or oval dead areas up to ½ inch in diameter develop on the leaves of infected plants. The lower leaves are usually most severely infected. The leaf-spots frequently develop growth rings in the form of concentric circles, and in the central ring a number of minute black specks may be seen—the fruiting bodies (*pycnidia*) of the fungus. The fungus attacks the pods as they form, and conspicuous dark brown or black circular sunken spots appear. Eventually the spots may unite until most of the surface of the pod is destroyed. Finally a flesh-pink mass of fungal spores develops in the centre of each lesion.

The fungus penetrates the seed through those areas which are in contact with the pod. Infected seeds may be recognized by the presence of brown circular markings on the seed coat. The concentric ring formation, which is common to both the leaf and pod lesions, sometimes appears on the seed.

Broad bean pods and seeds infected with *Ascochyta* sp.

Control

Growers who have experienced trouble with this disease should not retain the practice of saving their own seed. Seed should be introduced if possible from a comparatively arid region where the disease is unlikely to develop.

A rotation of at least three years should be practised, and refuse from a badly diseased crop should be destroyed by fire.

SPOTTED WILT OF TOMATOES

One of the most formidable problems of the tomato grower is a virus disease commonly known as Spotted Wilt. This disease was first discovered in Melbourne in 1915, and has since been recorded in practically every country in the world.

The virus is capable of infecting a wide range of plants, vegetables, ornamental plants and weeds, but the tomato is one of the most susceptible host plants. Ornamental plants such as Iceland poppies, ranunculi and dahlias assist in the perpetuation and dissemination of this disease. Iceland poppy and ranunculi seedlings usually become infected during late summer or autumn and enable the disease to persist throughout the winter months. The virus is also carried in dahlia tubers and ranunculi corms.

The incidence of Spotted Wilt is higher in the Melbourne district than in any other tomato-growing district of the State. It is considered that this is largely due to the greater number of infected host plants—particularly ornamental—in the metropolitan area. Infection exceeding 50 per cent. is not uncommon, particularly in home gardens.

Spotted wilt of tomatoes. The dwarfed plants in the foreground were infected with spotted wilt.

Symptoms

The earliest symptom of this disease on tomatoes is the occurrence of irregular bronze or chocolate markings on the young leaves. Occasionally, the markings may assume the form of concentric circles. The affected plant rapidly loses its vitality and growth ceases. Frequently, the young leaves at the top of the plant appear as if they have been scorched by a flame.

If infection occurs when the plant is approaching maturity, it may still produce a reduced quantity of marketable fruit. However, the mottled appearance of the fruit produced by infected plants usually detracts from its market value. The mottling assumes the form of yellow blotches or concentric rings on the skin of the fruit.

Plants which become infected when in the seedling or early blossoming stage rarely survive.

Dissemination of the Disease

The virus is spread from diseased to healthy tomato plants and from other infected host plants to tomatoes by the agency of two species of thrips (*Thrips tabaci* and *Frankliniella insularis*) both of which occur in Victoria.

Control

During the past two seasons experiments have been conducted at the Biological Branch of the Department to determine the effectiveness of a tartar emetic-brown sugar spray for control of the disease. It has been claimed that the infective thrips obtained a lethal dose from the spray deposit on the leaves, before they had fed sufficiently long to transmit the disease. Unfortunately the degree of infection which occurred in the sprayed plots during the course of the experiments was too high to permit this spray material to be recommended as a control measure for Spotted Wilt. At the present time, there are no positive measures for the control of this disease.

Commercial growers are advised to rogue out and replace infected plants and to practise clean cultivation. Perennial weeds such as black nightshade, plantains, &c., should be destroyed.

These weeds enable the virus to carry over from season to season, in the absence of other host plants.

Home gardeners must be prepared for losses up to 50 per cent. and should estimate their requirements accordingly It is a good plan when staking tomatoes to plant two tomatoes to a stake, and if one plant becomes infected it can be removed and replaced without leaving an unsightly blank space. It is very rarely that two plants on one stake become infected simultaneously.

Home gardeners should not persevere with infected plants, as the disease cannot be cured after the plants become infected.

A warning is also issued against the use of any proprietary brands of spray materials which may be advertised as a cure or preventive for "wilt" of tomatoes. At the present time, no spray material known will control the disease under Melbourne conditions.

As the disease is not soil-borne, growers need have no fear in replacing infected plants.

Plane Tree Leaf Scorch. Twig Infection.

Plane Tree Leaf Scorch. Leaf infection.

LEAF SCORCH OF THE PLANE TREE

Plane trees are frequently disfigured by the fungous disease known as Leaf Scorch or Anthracnose (*Gloeosporium nervisequum*). The disease first becomes noticeable when the buds burst in spring. Some of the young leaves become infected at this stage and turn brown and die. However, the more characteristic phase of the disease causes brown diseased spots on the leaves at a later stage of development. If these spots develop on the main veins of the leaf, a large proportion of the leaf dies. When a tree is heavily infected it has the appearance of having been scorched by fire, and many infected leaves fall. In extreme cases the tree may become completely defoliated.

The fungus also infects the young twigs and kills the affected bark. The bark later splits, leaving an open wound known as a canker. This stage is not only important because of the direct damage caused, but because the fungus is able to live through the winter in these twigs and in the following spring produce spores which infect the emerging leaves.

Control

The common practice of pollarding plane trees is a most important measure in controlling the disease as the infected twigs, in which the fungus overwinters, are thus removed. The prunings from the trees should be destroyed by burning. This measure alone will not be sufficient to control the disease, and the trees

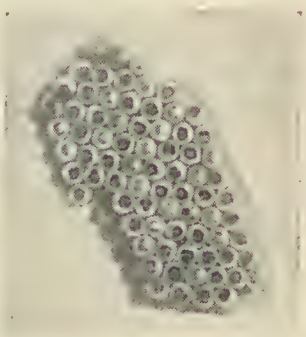
should be sprayed with 4:4:40 Bordeaux at bud burst and again about a week later. If the season is wet, and therefore favorable to the disease, further sprays should be given at fortnightly intervals.

To prepare 4:4:40 Bordeaux mixture, dissolve 4 lb. of copper sulphate (bluestone) in 36 gallons of water in the spray vat. The fine crystalline form known as "neige" or "snow" crystals dissolve more readily than the common large crystalline form. Then mix 4 lb. of water-slaked lime with 4 gallons of water and start the agitators of the vat. Then slowly pour the lime into the vat.

GREEN VEGETABLE BUG

The Green Vegetable Bug, which was earlier known as the Tomato Bug, feeds on a wide variety of plants, but its ability to damage French beans and tomatoes is particularly important under present-day conditions. The bug is about half an inch long and shield shaped; the colour is a fairly uniform grass green. The young insect, however, is at first a deep orange with black spots, but the colour changes with growth through different proportions of black, white, red, and green until the green adult stage is reached.

The green vegetable bug—adult insect.
a. Top view. b. Side view.



Egg cluster of green vegetable bug. Note eggs which have hatched.

The females overwinter in hiding without feeding, but with the increasing warmth of November come out and begin egg-laying. Eggs are deposited on tomato and bean foliage, mostly on the underneath surface. These are in neatly arranged batches of 30 to 80 eggs and are creamy white in colour.

Early sown French beans will serve as a trap crop, since if they are carefully examined, the eggs may be discovered and destroyed. Unfortunately these are not the only breeding plants.

Spraying and dusting have not given satisfactory field control.

A wasp parasite has been imported which parasitizes the eggs, but its numbers cannot be increased until these eggs become available. Growers are invited to forward egg clusters to the Plant Research Laboratory, Burnley E.1. These, after being exposed to the parasites, will be returned to the grower before the wasps emerge. The liberated parasites will then commence work in the field where it is hoped they may become a useful means of reducing the Green Vegetable Bug population.

GLADIOLUS THRIPS

The Gladiolus thrips may be readily identified when found on the plant. The adult is brown and a little over 1-16th of an inch long. Lying along the back are two pairs of narrow wings which are bordered with delicate fringes. From this feature the insect order to which it belongs is known as *Thysanoptera* or Fringe-wings. The immature insects are pale yellow in colour. These may not be detected so readily as they feed within the folds of the leaves and flower buds.

Gladiolus thrips is not favoured by cool wet weather, but thrives best under dry, hot conditions. The length of time from hatching to maturity depends on the favorableness or otherwise of the weather, but it may be as short as ten days.

Damage

The presence of thrips should be suspected when the leaves develop a silvery unnatural colour, as this is typical of thrips damage and is caused by removal of sap by the rasping and sucking action of the feeding insects. Blooms may be distorted or may fail to open. Thrips also feed on the corms during storage, and in doing so damage the surface, spoiling their appearance and sale value. Injury to the root-zone may also prevent germination.

Control

(*a*) Dipping—When this pest is suspected the corms should be immersed for 10 minutes in a suspension of 1 oz. of calomel in 1½ pints of water, keeping the water well agitated to prevent settling of calomel. Dipping in a solution of corrosive sublimate using ½oz. to 25 pints of water is also very effective. Metal containers should not be used for the solution. *This chemical is extremely poisonous if taken internally and should be kept away from irresponsible persons and domestic animals.* The corms should be immersed for 10 minutes for thrip control, although if bacterial scab is also present 10 hours would be necessary. It is important to dip the corms some time before the sprouting stage and to dry them thoroughly in an airy position before returning to storage.

(*b*) *Fumigation.*—Thrips may be destroyed also by storing with naphthalene for at least three weeks. Use 1 oz. of naphthalene flakes per 100 corms in a box or tin with a tightly fitting lid or a paper bag folded and tied. The corms should be removed from the naphthalene before sprouting commences, or injury will occur.

(*c*) *Clear Break in Planting.*—Heavy infestation of spring plantings is sometimes associated with the presence in the field during the off season of stray plants which carry the thrips through in large numbers. As a further means of control all stray plants on the property should be destroyed, and as long an interval as possible allowed between autumn and spring plantings.

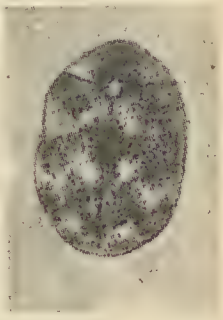
(*d*) *Foliage spraying.*—As soon as thrips infestation of growing plants is discovered the foliage should be sprayed with the following preparation:—

Brown sugar	4 ounces
Tartar emetic	2 ounces
Water	5 gallons

This spray does not injure the foliage and should be repeated at weekly intervals. It is more effective if applied as a fine mist, care being taken to avoid spray droplets coalescing.

CARPET BEETLES

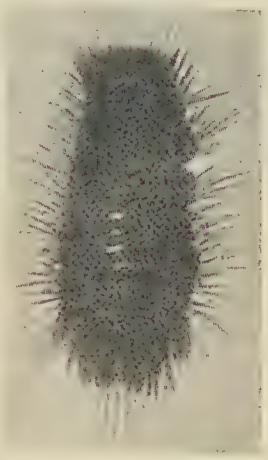
The most common species of Carpet Beetle in Victoria is the varied Carpet Beetle, *Anthrenus verbasci*, L. A black species, and a black and white species, *Cryptorhopalum australie* Hope, are also present, but to a much lesser extent.



The varied carpet beetle. (× 10 times.)

Damage

These pests attack furs, carpets, woollen clothing, skins, and silk; they have four distinct stages — egg larva or grub, pupa, and adult or beetle. Eggs are laid anywhere about the house, most frequently on any material of an animal nature that will provide food for the grubs when hatched. Wool, furs, carpets skins, and dried animal specimens are the most susceptible. Carpets are attacked in places where there is least chance of the larvae being disturbed, i.e., under pianos, around walls, &c.; only the pile is eaten.



Larva of the varied beetle. (× 10 times.)

The larva of the varied carpet beetle is a small, plump, brownish grub with three pairs of hair tufts at the end of the abdomen and a few long straggly hairs.

The larva moults several times, and the cast skins may be seen in the vicinity of the grub, giving the appearance of greater numbers of larva than are actually present.

The adult beetles are oval in shape and one-eighth to three-sixteenths of an inch long. The varied carpet beetle has four distinct white bars radiating from the mid-line to the wing covers. When the beetles freshly emerge, these bars are of golden colour and quite distinct.

The adults do no harm other than that of distributing eggs, their feeding being confined

[*Continued on page* 558.

THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley

Dahlias

IN the home garden, November is planting time for dahlias. Enthusiasts who desire their blooms to compete in the autumn flower shows often delay planting until early December, but for good garden effects, November, and even late October, are suitable times for planting. The important point to remember is that the soil should be warm at planting time. Tubers and plants placed in cold, wet soils are likely to rot, and if growth does occur it is often poor and liable to disease.

Three methods of planting dahlias are available to the home gardener, namely, seed or seedlings, tubers and green plants in pots.

Seed.—Seed is usually sown in September or October, and the young plants are ready for planting out in October and November. These seedlings produce flowers in the same year and also make tubers underground. The raising of seedlings is always fascinating, because one never knows what the result will be until the first flower opens. This is the method by which new varieties of dahlias are raised. Of course, many hundreds of blooms may be grown, and only a few of the best plants selected for future planting. The plants which produce inferior blooms are discarded. After further trial, those with good blooms are named and put on the market. So much hybridization has been carried on with dahlias that it is impossible to forecast the results to be obtained by raising chance seedlings, and rarely do they bear any resemblance to their parents.

Charm type of dahlia.

Once the tubers have formed, the home gardener has a very simple method of further propagating a seedling which he considers worth keeping in his garden. As the season is getting late, growers who do not wish to sow the actual seed but who still desire to grow seedling dahlias, may purchase seedlings for planting this month. Seedlings may be planted about two feet apart each way, and should be given good cultural treatment to obtain the best results.

Tubers.—For the home gardener who desires to replant some of his varieties this year, the division of the clump of dahlia tubers is a simple method. The dividing may be done as soon as the buds can be detected on the necks of the tubers. By a combination of cutting and breaking apart, the clump can be divided so that single tubers with at least one good "eye" or bud are obtained. One of these can be planted at each stake, spaced three feet apart each way, or two may be planted, one on either side of the stake. If one fails the other will probably grow, and if both grow they may be allowed to remain. Plant the tuber so that the bud is about four inches below the surface of the soil. If the soil is moist at planting time, there is no need to water for several weeks. At this stage more dahlia tubers die from rotting than from the soil being too dry. By careful division of the clump many single tubers with buds may be obtained. This enables a whole bed to be planted with one variety, which makes an attractive garden feature.

If the division of the clumps has been delayed and shoots have already commenced to protrude above the tubers, more care is necessary in dividing the clumps. The young shoots are very tender and may break off from the tuber, thereby rendering that tuber useless. If this occurs, cut off the remaining shoots about half an inch above the base before commencing to break up the clump. By this method the buds situated at the base of this shoot will be retained. New roots and tubers form from the base of the shoot which grows from the old tuber. These often may be seen on a clump which has not been planted, but which has commenced to grow.

Green Plants.—The majority of named varieties of dahlias purchased from nurserymen are raised from cuttings taken from the new shoots arising from the dahlia tubers. These tender cuttings are rooted in sand and then potted into a good loamy soil before dispatch. Such rooted cuttings are called "green plants." When planting, these green plants are knocked out of the pot by placing the fingers across the soil and holding the plant between the fingers of the left hand, inverting the pot, and then tapping the edge of the pot sharply on a ledge or the spade handle. Plant and soil will then be removed intact from the pot, and should be planted without disturbing the root system. Place some light shading, provided by prunings from shrubs or trees, over the green plant for several days until it is well established.

It is not necessary to place manure in the hole when planting dahlias. The best results will be obtained by thorough preparation of the soil a few weeks before planting. Add well decayed stable manure or compost to the beds and dig it in. Postpone any intensive feeding until the first flower buds appear.

Varieties

Many hundreds of varieties of dahlia are catalogued by nurserymen, and these include all classes from the Giant Informal Decorative, which may measure a foot or more in diameter, to the small Pompone class, which is about $1\frac{3}{4}$ inch in diameter. If you want to grow exceptionally large dahlias you must choose large-flowered varieties and do the necessary feeding and disbudding.

Giant Decorative Dahlias.—*Daily Mail,* bronze gold; *Dawson,* salmon and yellow; *Pink Daily Mail,* pink; *Croydon Wonder,* red; *Kathleen Norris,* pink; *Duke of Windsor,* dark red.

Giant Garden Cactus Dahlias.—*Enkart Prima,* salmon pink and primrose yellow; *Frau O'Bracht,* pale lemon yellow; *Golden Age,* gold; *Satan,* red.

Miniature Garden Cactus Dahlias.—*Betty Holmes,* light orange; *Dorothy Allender,* orange-flame; *Dorothy Jessep,* shell-pink; *Burnette Delight,* orange, scarlet and gold; *Little Snow Queen,* white; *Market Glory,* lilac rose; *Florence Nichols,* apricot; *Kensington Ruby,* maroon and red.

Charm Dahlias.—*Casula Flame,* bright orange; *Betty Usher,* red; *Burnette Gold,* golden; *Leiden's Miniature,* deep rose salmon.

Pompone Dahlias.—*Rhonda,* lilac; *Brittain's Delight,* deep yellow; *Doria,* maroon; and *Margaret Williams,* rose pink.

IN THE ORCHARD

Contributed by the Horticultural Division

Grafting

WHERE trees have been grafted during the spring, an inspection should be made of the sealing material, and if any cracks have appeared these should be covered with fresh material. It is important also to protect the large wounds made in cutting out limbs from trees. Previous applications of Bordeaux paste, white lead paint, or bituminous paint should be examined and if necessary another coat should be applied. Some time spent on such large cuts in trees will be well repaid in the prevention of damage by wood-rotting fungi.

Pears

Although the pear crop appears likely to be as heavy as last year, it is evident that some varieties such as Josephine, Beurre Bosc and Winter Cole will be light, and in some instances

growers may decide not to spray such trees. Under these circumstances, it is advisable to go over the trees and remove the few remaining fruits, otherwise they will serve as a breeding ground for codling moth and so cause trouble in adjacent areas. A warning concerning the pear and cherry slug is also necessary. This insect may cause damage to leaves of unsprayed trees, considerably reducing the effective leaf area and eventually affecting the health of the tree. Should the small slimy grubs be noticed on the leaves, a spray of lead arsenate will be required. One thorough spraying ought to be sufficient to control this pest.

Stone Fruit

Reports of brown rot infection occurring on blossom and twigs of peaches, apricots and plums have been received from several districts. This is probably a result of insufficient sanitation measures during the winter. Instances have been noted where last season's infected fruit were allowed to remain on the trees instead of being collected and destroyed. A spray of dry-mix lime sulphur made by mixing 16 lb. fine sulphur, 8 lb fine grade hydrated lime and 1 lb. lime casein spreader may be used for further protection of peach fruit. This mixture is used in 100 gallons of water, and it should be thoroughly agitated in order to keep the components well dispersed. Sulphur sprays should not be applied to apricots because of the danger of injury. For cherries, lime sulphur at strength 1 in 80 may be used until the fruit is half grown as a protection against infection.

Cherry Cracking

Cherry growers frequently suffer heavy losses just prior to harvesting because of rain causing the fruit to crack. Some growers have largely reduced this loss by spraying the trees with white oil, strength 1 gallon in 80, if the weather becomes threatening prior to harvest. Because of injury which is likely to occur should oil and sulphur sprays be applied within a short period of each other, cherry trees should not be sprayed with oil if sulphur sprays have been used for brown rot control less than three weeks previously.

Cutworm Damage to Peaches

In November of last year some damage to peaches occurred from cutworms. Lead arsenate alone cannot be used for control because of the danger of burning the foliage. However, a combination of 6 lb. lead arsenate paste, 6 lb. sulphate of iron or sulphate of zinc, and 6 lb. slaked lime may be used in 100 gallons water. The iron or zinc sulphate should be dissolved and added to the spray vat first, the slaked lime should then be added, and finally the lead arsenate. Do not spray on a very hot day.

BIOLOGICAL NOTES—*continued from page 555.*

to a vegetable diet. Great numbers of them are often found feeding on the pollen of garden flowers; thus fly-wire fixtures are of definite value in protecting a house from invasion; similarly, tightly-fitting doors, floors, &c., are quite important.

Control

The best control is frequent inspection of susceptible material, accompanied by brushing, beating and sweeping. Cleaning is made easier if all cracks and gaps in floors, cupboards and shelves are filled with cold water putty, obtainable from paint manufacturers.

Periodical exposure of movable articles to bright sunshine destroys many eggs, and brushing dislodges others. Where this treatment is carried out at three-weekly intervals, damage is not likely to be experienced.

Spraying of corners and carpet edges with pyrethrum-kerosene preparations as sold for fly and mosquito control, is a valuable supplementary practice. Wall-to-wall carpets which are tacked down permanently should be sprayed periodically.

Dusting along the floor against the walls with a little sodium-fluoride or silico fluoride powder is an excellent protection against these pests. The fluoride is a poison, although not extremely toxic to man in small quantities. Surplus powder should not be left exposed where children could contaminate their fingers or food.

The liberal use of paradichlorobenzene crystals or of naphthalene flakes is a valuable safeguard against attacks by these and other fabric pests. Place the flakes beneath the edges of carpets, in corners and at the back of shelves.

In an airtight container, 2 to 3 oz. of either chemical per cubic foot of volume, will destroy any larvae already present in clothing, &c., or which may hatch from unremoved eggs. The pure chemicals will not destroy or stain fabric. The commercial forms obtainable from drug stores will be suited to most requirements.

is coarser, however, when they mature in hot weather. Swedes are a winter crop only. Thinnings and young leaves are a good substitute for spinach.

Table Queen Squash.

Swedes can be stored in a cool place for extended periods. For this reason and also because they have a higher food value, swedes are more valuable than white turnips, but in Melbourne require more attention to grow well.

Radishes

Radishes are useful for salads and garnishing. They are the quickest maturing crop which can be grown in the home garden. The seed can be sown with carrot or parsnip seed with advantage. The seedlings are vigorous, and break any crust on the soil, so allowing the more delicate carrot and parsnip seedlings to come through. They also mark the row so that inter-row cultivation may be carried out before the carrots and parsnips appear. The radishes may be left in the row until big enough for use, and the carrot or parsnip seedlings thinned when they are pulled. They can be interplanted with lettuces also, as they are ready for harvesting from six to eight weeks from sowing in the spring and summer months.

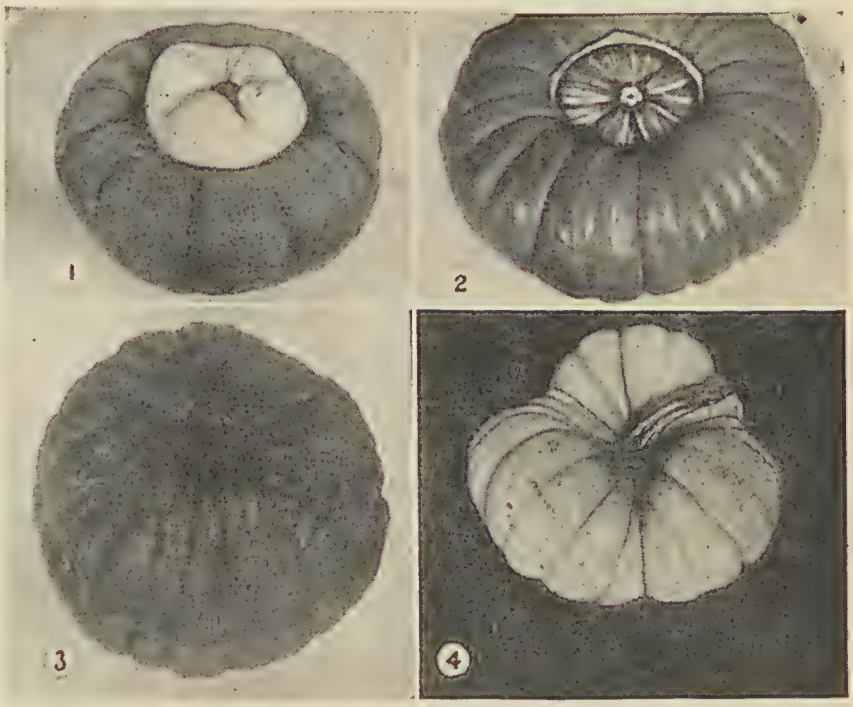
The chief pests of turnips and radishes are green grubs of cabbage moth and butterfly, which eat the leaves.

Pumpkins, Squashes, Marrows, and Cucumbers

These luxuriant, summer-growing vines are gross feeders and respond best to a heavy dressing of well-rotted stable manure worked into the soil before planting. The seed is sown in groups of three or four where the plants are to remain on a "hill" surrounded by a shallow hollow. Two seedlings in each group are allowed to grow on. If stable manure is not available, work in 4 oz. of blood and bone under each hill.

Seeds of these plants may be sown in seed boxes and transplanted. Better still, they can be sown in groups of two or three in a pot, perforated jam tin, strawberry punnet, &c., so that they may be transplanted to the hill when frost danger is over.

Bush varieties of squash and marrow are best for the home garden. When runners of pumpkin and cucumber vines are three or four feet long, they hould have their tips pinched out. Male flowers should not be removed. The number of flowers which set may be increased by dusting pollen from the male flowers on to the sticky tip of the style of the female flowers, using a small soft brush or a feather.



1—Turk's Cap (high crown). 2—Turk's Cap (low crown). 3—Queensland Blue (Beaudesert) pumpkin. 4—Triamble pumpkin.

Start dusting your cabbages and cauliflowers when you see this white butterfly about.

Pumpkins, such as Triamble and Queensland Blue, may be stored for several months in a cool, well-ventilated shed, provided they are fully mature when cut, and that an inch or two of stalk is left attached to each one. Bruising and breaking of the rind should be avoided. Turk's Caps and the excellent Table Queen squash will store for some weeks; most of the other cucurbits must be used soon after they are cut.

Chief disease is downy mildew.

Potatoes

The potato crop is frost-sensitive, and in most Victorian localities tubers should not be planted before August.

Potatoes like an acid soil, and are good also for breaking in new soil. If they are grown in a soil which has been heavily limed they are likely to become scabby. Before planting, seed potatoes should be exposed to light until their skin becomes green. Good strong shoots will then develop. The best "seed" is obtained by cutting up medium-sized potatoes just before planting to give pieces about 1½ inches diameter, each having two or three "eyes". Small whole potatoes are more likely to carry virus diseases.

Celery

Celery should be "blanched," that is, the stalks must be made to grow white or cream instead of the natural green colour unless it is required for cooking only. This can be done by planting the seedlings in a trench, and gradually filling the soil in as they grow, keeping it just below the leaves. It can be done also by planting the seedlings at ground level, and fixing boards close in to each side of the row as the plants grow. Other methods consist of wrapping several layers of newspaper around each plant, or placing earthenware pipes of 4 inches diameter over each plant about three weeks before plants are large enough for use. Even the "Self Blanching" variety recommended for home gardeners will be green on the outer stems unless the above methods are used.

The chief disease is celery rust.

Rhubarb

Rhubarb is a perennial, and the roots must be planted where they can remain for some years. Roots are best planted out in June, preferably in soil where animal manure has not been applied for a year or two, and care should be taken not to cover the buds with soil. When the plants begin to grow, they may be mulched with animal manure, or dressed with market-garden manure. Roots should be lifted and divided about the fifth year. Do not pick heavily in the first year in order that rapid growth of the plant may occur.

Most varieties do not produce stalks all the year round. The three varieties suggested in the planting table will ensure that rhubarb is always available.

Dusting with a cover over the plant is most effective, particularly for aphis.

Chief disease is mildew and affected leaves should be destroyed. They may show brown spots which dry out or if damp may develop typical furry mildew.

Asparagus

Asparagus is a perennial and a well-treated bed may last fifteen years. The soil should be trenched deeply and enriched with well-rotted animal manure before planting. The bed is best planted with two-year-old crowns. No shoots should be picked during the first season, and cutting should cease at the end of October in the second season. In June, when the foliage is completely dry, cut it down and give the bed a shallow forking. A heavy dressing of animal or blood and bone manure should then be applied. When the shoots come through in spring, they should be cut about 6 to 8 inches below the surface as soon as the tip can be seen. Daily cutting is necessary, and fortnightly dressings of liquid sulphate of ammonia and keeping the beds moist, will maintain the yield throughout the cutting season. After mid-December, no more shoots should be cut for the rest of the season. The application of salt to asparagus beds is unnecessary. No watering after the cutting season is necessary.

Jerusalem Artichoke

Jerusalem artichoke is a tall, sunflower-like plant producing quantities of knobby tubers which make a good alternative to potatoes in the diet. It is treated much as potatoes are—small smooth tubers are saved for "seed," planted during the late winter, and manured and watered well. It is ready to harvest when flowering is over. It is particularly free of pests and very easy to grow. A dozen plants will supply a family of five. They are best planted in an out-of-the-way corner.

Sweet Corn

Sweet corn is an attractive plant, and the cobs are a tasty and valuable food. It is useful as a windbreak to other crops. The cobs are ready to pick when the silks (tassels) have withered and the cobs feel plump. The white types produce an average of two cobs, and the yellow types an average of one cob per plant.

Shallots

Shallots thrive in soil conditions similar to those required by the onion crop.

The crop is propagated by planting the small bulblets during March–April. The plants die down about eight to ten months after establishment, and the bulbs are lifted when the tops have dried off. Bulbs should be allowed to cure in the open for several days and then transferred to a well-ventilated shed or other convenient position under cover for storage. During the growing period they can be used in salads; the dry bulbs are used for flavouring or for pickles.

WARNING

The preservation of vegetables, other than tomatoes or rhubarb by bottling at home is not recommended. This is because investigations have revealed that vegetables may be infected with the organism, *Clostridium botulinum.* This organism is not destroyed by sterilization at the temperature of boiling water and, in sealed bottles and tins containing non-acid products such as vegetables and meats, may produce a poison so powerful that the smallest taste of the infected contents may cause death.

Don't take the risk of bottling vegetables. Preserve them with safety by salting, drying, or pickling.

The above warning does not apply to the bottling of fruits, tomatoes, or rhubarb. This is quite safe and is recommended.

PLANTING TABLE FOR HOME GARDENERS IN SOUTHERN VICTORIA

Planting times may be extended a month earlier and later with less chance of success.

Order of Priority. (See footnote.)	Crop. / Variety.	Best Time to Sow Seed.	Method of Sowing.	Depth of Sowing.	Distance between Seeds.	Distance between Rows.	Distance between Plants.	Time to Thin or Transplant.
				Inches.	Inches.	Inches.	Inches.	
1	Carrot	Dec.–Jan. and Aug.–Oct.	Shallow drill ..	½–¾	½	10–12	2–3	2″ high
1	Parsnip	Dec.–Jan. and Aug.–Oct.	,, ,, ..	½–¾	½	12–15	3–4	2″ ,,
1	Red Beet ..	Feb.–Mar. and Aug.–Oct.	,, ,, ..	¾–1	1	12–15	4	2″ ,,
1	Silver Beet ..	Jan.–Sept. ..	,, ,, ..	¾–1	1	18	12	3″ ,,
2	Spinach—							
	Prickly Seeded ..	Feb.–Mar. ..	,, ,, ..	½–¾	1	12–15	6	2″ ,,
	Round Seeded ..	Aug.–Sept. ..	,, ,, ..	½–¾	1	12–15	6	2″ ,,
2	Chinese Cabbage ..	Sept.–Oct. ..	Seed-bed ..	¾–1	1	18	15	3″ ,,
1	Lettuce—							
	Imperial 847 ..	Nov.–Feb. ..	Shallow drill or seed-bed	½–¾	½	12	10	2″ ,,
	Imperial D and Cos	Mar.–May ..	,, ,, ,,	½–¾	½	12	10	2″ ,,
	New York and Imperial 615	Aug.–Sept. ..	,, ,, ,,	½–¾	½	12	10	2″ ,,
	Iceberg and Imperial 44	Oct.–Nov. ..	,, ,, ,,	½–¾	½	12	10	2″ ,,
2	Endive	Aug.–Mar. ..	,, ,, ,,	½–¾	½	12	10	2″ ,,
1	French Beans—							
	Brown Beauty ..	Oct.–Nov. ..	Drill or dibble	1–2	5	15–18	5	..
	Butter Beans ..	Oct.–Feb. ..						
	Other Varieties ..	Oct.–Jan. ..						
						Feet.		
1	Climbing Beans ..	Oct.–Nov. ..	,, ,,	1–2	9	2–3	9	..
1	Broad Beans ..	Mar.–May ..	,, ,,	2–2½	9	2	9	..
						Inches.		
2	Pea—							
	Melbourne Market	June–Aug. ..	,, ,,	1½–2	2–3	12–15	2–3	..
	Greenfeast ..	July–Dec. ..	,, ,,	1½–2	2–3	12–15	2–3	..
	Yorkshire Hero ..	Nov.–Feb. ..	,, ,,	1½–2	2–3	12–15	2–3	..
						Staked	ft. in.	
1	Tomatoes (see text)—					Feet.	1 6	Oct.
	Early	Aug.–Sept. ..	Seed-bed ..	¼	..	2 0		Nov.
	Midseason ..	Sept. ..				Un-	2 0	Dec.
	Late	Oct. ..				staked		
	Onions—					3 0		
1	Early Flat White	Feb.–Mar. ..						
	Silverskin ..					Inches.	Inches.	
2	Odourless ..	Apr.–May ..						
	Early Globe ..		,, ..	½	..	10–12	3–4	6″ high
3	Brown Globe ..	May–June ..						
	Aust. Brown ..							
	White Imperial ..	June–July ..						
	(White Spanish)							
2	Leeks	Feb.–Apr. and Sept.–Nov.	,, ..	½	..	0 15	0 5	6–8″ high
2	Cabbages—					ft. in.	ft. in.	
	St. John's Day ..	Sept. ..						Late
	Succession ..	Oct. ..						Nov.
	East Ham ..	Late Jan. ..	,, ..	¼–½	..	2 6	2 0	Jan.
	Savoy	Late Jan.–Feb.						Mar.
	Parisian ..	May–June						Mar.
								July

The numbers on the left of the table suggest the probable value of the crops to the home gardener:—

1. Indicates crops which should be in every home garden.
2. Indicates crops requiring more space and greater attention to pest control, or useful alternatives to certain crops in Group 1. The larger garden could well contain a selection of these.
3. Indicates crops which should not be planted to the exclusion of crops in Groups 1 and 2.

Planting Table for Home Gardeners in Southern Victoria—*continued.*

Order of Priority. (See footnote.)	Crop. / Variety.	Best Time to Sow Seed.	Method of Sowing.	Depth of Sowing.	Distance between Seeds.	Distance between Rows.	Distance between Plants.	Time to Thin or Transplant.
				Inches.	ft. in.	ft. in.	ft. in.	
2	Cauliflowers—							
	Green Leaf ..	Dec. ..	Seed-bed ..	¼–½	..	2 6	2 0	Feb Mar.
	Phenomenal ..	Jan. ..						
2	Brussels Sprouts—							
	Fillbasket ..	Nov.–Dec. ..	,, ..	¼–½	..	2 6	2 0	Jan.–Feb.
2	Borecole (Kale)							
	Green Curled) ..	Feb.–Apr. and Oct.–Nov	,, ..	¼–½	..	2 0	1 6	Apr. June and Dec.–Jan.
2	Green Sprouting Broccoli	Feb.–Apr. and Oct.–Nov.	,, ..	¼–½	..	2 6	2 0	Apr.–June and Dec.–Jan.
2	White Turnips—							
	White Stone ..	Feb.–Mar. and	In drills ..	¼–½	0 1	1 0	0 4	3″ high
	White Egg ..	Aug.–Sept.						
3	Swede Turnips—							
	Laing's Garden ..	Jan.–Feb. and	,, ..	¼–½	0 1	1 6	0 6	3″ ,,
	Champion Purple Top	July–Aug.						
3	Radishes	All year ..	,, ..	½	0 1	0 9	0 1	..
3	Pumpkins—							
	Turk's Cap ..	Oct.–Dec. ..	In groups of 3 or 4	1–2	6 0	6 0	..	3″ ,,
	Triamble ..							
	Queensland Blue							
2	Squashes—							
	Table Queen ..	Oct.–Dec. ..	,, ,, ,,	1–2	3 0	4 0	..	3″ ,,
	Green Hubbard ..							
3	Marrows—							
	White Bush ..	Oct.–Dec. ..	,, ,, ,,	1–2	3 0	3 0	..	3″ ,,
	Green Bush ..							
2	Cucumbers—							
	Long(Green Prickly	Oct.–Dec. ...	,, ,, ,,	1–2	3 0	4 0	..	3″ ,,
	Crystal Apple ..							
3	Potatoes—							
	No. 1 Carman ..	Aug.–Sept. ..	Deep furrows	5	..	2 6	1 3	..
	No. 3 Carman ..	Oct.–Dec. ..						
	Up-to-date ..							
3	Celery—							
	Self-Blanching ..	Oct.–Dec. ..	Seed-bed ..	¼	..	2 0	0 8	5″ ,,
2	Rhubarb—							
	Wilson's Ruby ..	Crowns in May–July	.. ..	..	..	3 0	2 6	..
	Topp's Winter ..							
	Stone's Everbearing							
3	Asparagus—							
	Mary Washington	Crowns in	.. ..	..	..	4 0	1 6	..
	Connover's Colossal	May–July						
3	Jerusalem Artichoke	July–Aug. ..	Deep furrows..	5	..	3 0	1 3	..
3	Sweet Corn—							
	Country Gentleman	Oct.–Nov. ..	Drill or dibble	1	0 6	2 6	0 6	..
	Golden Bantam ..							
3	Shallots	Bulblets in Mar.–Apr.	Rows ..	1–2	..	1 0	0 6	..

The numbers on the left of the table suggest the probable value of the crops to the home gardener:—

1. Indicates crops which should be in every home garden.
2. Indicates crops requiring more space and greater attention to pest control, or useful alternatives to certain crops in Group 1. The larger garden could well contain a selection of these.
3. Indicates crops which should not be planted to the exclusion of crops in Groups 1 and 2.

FAMILY SUPPLY TABLE

The time taken to reach maturity, the period over which the crop may be used, and the approximate length of row required at each planting to supply a family of five are shown in the following table :—

Crop.	Time from Planting to Maturity.	Period of Usage in Fresh State.	Storage.	Quantity per Planting for Family of Five.
	Weeks.			Feet of row.
Carrot	12–16	8th–17th week	3 months	50
Parsnip	20–24	18th–30th week	3 months	50
Red Beet	10–12	10th–17th week	3 months	30
Silver Beet	8–12	Continues to crop for period up to 12 months with main crop in winter and spring	..	15
Spinach	8–10	6th–12th week	..	20
Lettuce and Endive	8–12	6th–12th week	..	25
French Beans	10–12	10th–14th week	Dried or salted	30
Climbing Beans	10–12	10th–26th week	Dried or salted	6
Broad Beans	18–20	18th–26th week	Dried or salted	20
Peas	12–16	12th–16th week	..	30
Tomatoes	16	16th–25th week	In bottles	12 plants
Cabbages	16–20	14th–21st week	2 weeks	18 plants
Cauliflowers	16–20	16th–21st week	2 weeks	18 plants
Brussels Sprouts	16	May to Sept.	2 weeks	12 plants
Chinese Cabbage	8–12	Continues to crop for six months	..	18 plants
Borecole (Kale)	10	Continues to crop for six months	..	6 plants
Green Sprouting Broccoli	16–20	16th–30th week	..	18 plants
White Turnips	12–13	10th–14th week	4 weeks	30 feet of row
Swede Turnips	16	14th–18th week	8 weeks	30 feet of row
Radishes	6–8	6th–8th week	..	6 feet of row
Onions—				
Early White, Silverskin, Odourless, Early Globe	28–32	24th–36th week	6–8 weeks	50 feet
Brown Globe and White Imperial	32	25th–32nd week	20 weeks	72 feet of row
Australian Brown	32	25th–32nd week	30 weeks	72 feet of row
Leek	35	25th–35th week	Dried	30 feet
Pumpkins	14–17	12th–20th week	5 months	6 groups
Squashes	14–17	12th–20th week	3 months	6 groups
Marrows	14–17	12th–20th week	2 months	6 groups
Potatoes	21	Jan.–May	4 months	12 plants
Jerusalem Artichoke	40	May–July	3 months*	70 plants
Celery	20	16th–24th week	..	12 plants
Sweet Corn	12–16	12th–16th week	..	12 plants
Shallots	34	..	Dried	12 plants
Rhubarb	60	Wilson's Ruby—Sept.–Mar. Topp's Winter—Mar.–Aug. Stone's Everbearing—Aug.–Mar.	In bottles	6 plants
Asparagus	65	Sept.–Dec.	..	40 plants

* Store in dry sand or sawdust.

PUT PESTS IN THEIR PROPER PLACE!

The aim of the home gardener should be to control pests in his garden. To do this he must know how to deal with them; he must act now and not next week; he must use efficient equipment for the work; and he must thoroughly spray or dust all upper and lower surfaces of plants.

1. Insects which chew holes are killed with stomach poisons, such as lead arsenate or derris applied on to the surface of plants by spraying or dusting, or by means of poison baits placed on the ground near the base of the plants.

2. Insects such as aphids which insert their beaks into the plant and suck its sap, must be drenched or dusted with a contact insecticide such as nicotine sulphate or derris (which is a dual purpose insecticide but, unfortunately is not obtainable during the war). Treatment in the warm part of the day is best for contact insecticides on sucking insects.

3. Fungous diseases are attacked with either sprays or dusts containing copper or sulphur compounds.

4. Dusts are best applied in early morning or evening when the air is still and the plants are damp. Baits should be laid at sundown. If moistened on succeeding nights they will still be effective. Sprays may be applied at any time, but it is safer to avoid very hot parts of the day.

5. Dusting may be done with a small hand-duster, bellows, or a muslin bag shaken over each plant. A puff of dust through a hole in a kerosene tin or box inverted over a plant will give effective coverage. The tin or box should be left in position for about five minutes. This method of covering the plant is particularly effective for control of aphis with nicotine dust.

Spraying may be done with a bucket pump, hand atomizer, or fly-spray. A fine spray should be used at a good pressure, and the liquid stirred or shaken while spraying.

Spray with a bucket pump (1) or hand atomizer (2). Dust with a hand duster (3) or by shaking a muslin bag over each plant (4) while the air is still and the plants are moist.

Insect Pest or Disease.	Plants Attacked.	Symptoms.	Treatment.
Cabbage white butterfly grubs	Cabbage, cauliflower, turnips, radish, kale, broccoli	White butterflies will be seen flying around plants. Look for tiny green grubs on undersides of leaves. Caterpillar—1¼ inches long when fully grown, velvety-green with yellow stripe down back and rows of yellow spots on sides	As soon as butterflies are noticed, *dust* with 50 per cent. lead arsenate dust, or *spray* with 2 oz. lead arsenate in 4 gallons water. Treat every 10 to 14 days
Cabbage moth grubs	Cabbage, cauliflower, turnips, radish, kale, broccoli	Holes eaten in leaves. Caterpillar, green; ⅓rd inch when fully grown	As for cabbage white butterfly
Cutworms ..	All crops ..	Young plants nipped off at ground level. Foliage of mature plants damaged. Greyish-green caterpillars hide in soil at base of plant in day-time	As above, *plus*:—*Bait* made by mixing 4 lb. bran or chopped up greenstuff with 3 oz. Paris green or sodium arsenate, or 6 oz. lead arsenate, 1½ oz. salt, and ½ gallon water. Mix thoroughly and spread around plants in evening. Do not allow bait to touch plants. Keep soil surrounding crop free of weeds
Vegetable weevil	All crops ..	Young plants nipped off at ground level. Holes eaten in foliage of larger plants	*Bait* or *spray* as above
Tomato moth ..	Tomato ..	Holes eaten into fruit usually at stalk end	*Dust* with 50 per cent. lead arsenate or *spray* with 2 oz. lead arsenate in 1 gallon water every 10 to 14 days
Slugs and snails	Most vegetable plants in seedling stage	Leaves and growing point eaten ..	*Bait* with 4 lb. of bran or chopped up greenstuff, ½ lb. calcium arsenate and ½ gallon water. Mix thoroughly and spread around plants in evening
Red spider ..	Beans ..	Leaves become yellowish and dry looking	*Spray* with lime sulphur, ½ pint in 4 gallons water or *dust* with sulphur. *Spray* or *dust* must reach undersides of leaves
Aphids (Blight)	All crops ..	Plants become covered with small slow-moving grey-green or black insects which suck the plant and cause wilting and yellowing of leaves	*Spray* with nicotine sulphate, one teaspoonful in a gallon of water, together with 1 oz. of soft soap, or *dust* with combined nicotine—lead arsenate dust
Pea mite and red-legged earth mite	All crops ..	Seedlings attacked by minute black-bodied red-legged insects, causing wilting	Keep land free of weeds prior to sowing seed. *Dust* seedlings with mixed nicotine-creosote *dust* or *spray* with nicotine sulphate, one teaspoonful, together with 1 oz. soft soap in one gallon of water
Harlequin bug	All crops ..	Red and black backed insects suck juices from plant, causing wilting	Lay out pieces of old bag on ground near crop and daily collect insects which hide underneath. *Spray* or *dust* with nicotine as for pea mite. Clean cultivation essential

——IDENTIFICATION AND CONTROL

Insect Pest or Disease.	Plants Attacked.	Symptoms.	Treatment.
Rutherglen bug (or fly)	All crops ..	Brown narrow, quick moving insect like small fly, ⅛th inch long; usually in large numbers. Sucks juice, causing wilting	Nicotine *dust* or *spray* as for pea mite for immature insects. Adults difficult to control. Clean cultivation essential
Green vegetable bug	All crops ..	Shield-shaped insect, ½ inch long, green in colour. Sucks juices, causing wilting	Adults difficult to control. Shake plants to dislodge insects, collect and destroy. Treat as for Rutherglen bug when first noticed
Spotted wilt ..	Tomato ..	Foliage becomes bronzed, with dark irregular markings. Leaves become wilted and yellow	Remove and destroy infected plants as soon as disease is noticed
Bacterial canker	Tomato ..	Foliage turns brown and dies, usually on one side of plant	*Dust* seed as discussed in text under Seed Treatment
Septoria spot ..	Tomato ..	Small dark spots on leaves which shrivel and die when infection becomes severe	*Dust* with copper dust or spray with Bordeaux mixture (see Note)
Target spot ..	Tomato ..	Large, dark spots with concentric rings	As for Septoria spot
Downy mildew	Lettuce ..	Greyish patches on leaves, which become slimy	*Spray* with Bordeaux mixture (see Note). Do not use overhead sprinklers for watering
Downy mildew	Onion ..	Blighted furry patches on leaves ..	No simple control. Grow plants in open situation
Downy or powdery mildew	Pumpkins, squashes, marrow, cucumber	Powdery or downy spots on leaves which wilt and turn yellow	*Spray* cucumbers with Bordeaux mixture (see Note). *Dust* other varieties with sulphur
Halo blight ..	Beans ..	Small, circular, water-soaked patches on beans	Obtain disease-free seed. Reject seed showing "blisters"
Fusarium root rot	Many crops, especially beans, tomatoes	Red or pinkish discolouration of roots and stem below ground level. Plant usually wilts and dies	Remove infected plants and burn. Do not plant on soil previously growing infected plants. Wet soil encourages this disease
Rust	Broad bean, celery, parsnip	Small dark coloured spots on leaves	*Spray* with Bordeaux mixture (see Note)
Ascochyta Blight Septoria spot	Peas ..	Spots on pods and leaves and dark streaks on stem, which may rot. Plant yellows and dries out	Don't sow seed showing brown patches and dust seed before planting. Do not sow in wet situation and avoid overwatering in early stages of growth. Don't plant on land previously carrying a diseased pea crop

NOTE.—Bordeaux Mixture is made by dissolving 6 oz. bluestone in 2 gallons water in non-metallic vessel, 6 oz. slaked lime in 2 gallons water, and combining both solutions.

SEED OATS

By J. BRAKE, B.Agr.Sc.,
Agricultural Superintendent

SEED oats for sowing in 1944 should be selected and secured by farmers before or during the coming harvest. The area sown this season is smaller than usual and the demand for hay is such that many of the crops most suitable for seed will be cut. The quantity of oats that will come forward from northern districts is problematical, but will certainly be limited owing to the dry season.

It may be difficult for merchants and farmers to obtain high quality seed free from foreign grains such as barley and seeds of various weeds. It is regretted that, in the past, farmers have taken insufficient care in the selection of their oat seed, with the result that clean crops are an exception. It is realized, of course, that the production of oats on the stubble of wheat or barley crops frequently results in the stripping of impure oats, but it is known also that dirty seed is often sown on clean land.

Members of the Melbourne Corn Exchange, an Association of grain merchants and allied interests, for many years have co-operated with the Department of Agriculture in the fixing of annual Oat Standards. These are based on samples representative of the oats coming forward from the whole of Victoria. Recent standards indicate that the quality of the oat samples are deteriorating rather than improving and concern as to the future is therefore justified.

The grower of good clean milling oats has always been able to obtain a better price for his product than the producer of a poor sample, although sometimes the margin is small. When the crop is sown, it is not certain for what purpose it will be harvested, which is another reason why clean seed should be selected.

The Secretary of the Melbourne Corn Exchange, Mr. W. L. Osbourne, has advised the Department of Agriculture that the Exchange proposes to encourage the production of high quality seed and milling oats by donating a trophy for a competition amongst growers next season. Particulars of the competition will be announced when final arrangements are made.

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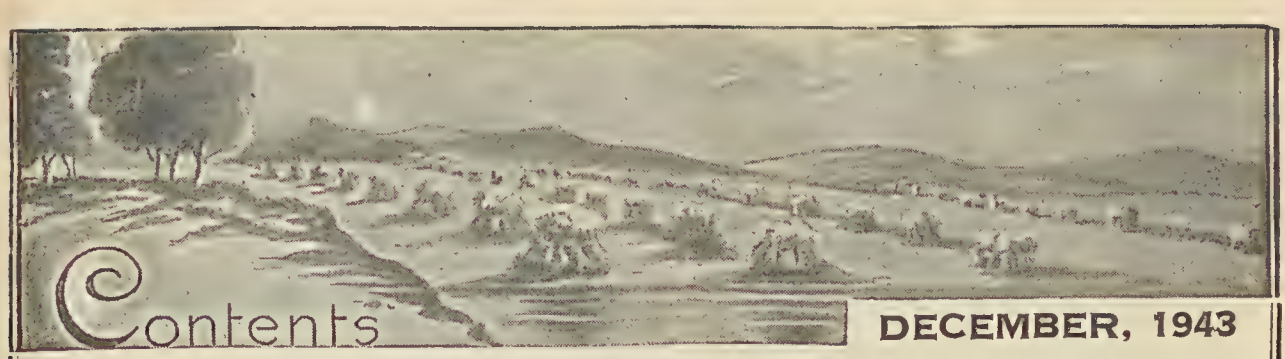

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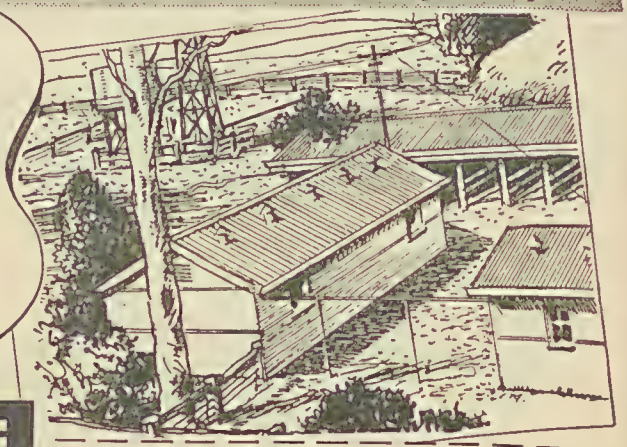

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Victoria Needs Four Hundred Thousand Dairy Calves Next Year

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

During 1941-42 and 1942-43 there were record slaughterings of cows, reducing the numbers of dairy cows to such low levels that production of dairy produce has fallen below requirements. To ensure that production shall be maintained and that there are sufficient dairy cows to meet the demand likely to arise when soldiers are repatriated to dairy farms, it will be necessary to rear 400,000 heifer calves during 1944 and another 400,000 during 1945. To raise these numbers it will be necessary to rear every heifer calf and to reduce culling to a minimum.

More calves are needed to produce the extra milk, butter, cheese, dried milk and condensed milk required for the services, civilians and export; to produce more beef and veal; and to replace the large numbers of cows slaughtered during the past two years.

MILK, butter, cheese, beef and veal are among the foods so urgently required by the nation for service and civilian requirements and export overseas. The dairying industry is depended upon to produce all these foods, but because of labour shortages, the difficulty of securing adequate and regular food supplies, and the high prices obtainable for dairy cattle from the butcher, involving the slaughter of large numbers of cows, the industry has not been able to fulfill all the demands made on it.

In 1942, 764,000 cattle including 166,000 bullocks, 239,000 cows, 72,000 young cattle, and 287,000 bobby calves were slaughtered in Victoria to produce 118,000 tons of beef and veal. The number of cows slaughtered was the greatest ever recorded in this State and unless these cows are replaced quickly, future requirements of dairy produce and meat cannot be met. An increase in the number of dairy cattle, therefore is imperative, and this can be brought about only by rearing more heifer calves.

Allowing for deaths and the numbers slaughtered for meat, it is estimated that it is necessary to rear 300,000 dairy heifer calves each year, to maintain dairy herds at the desired level, but the number of two year old heifers (heifers for dairying) and of calves under one year old reared in the past two years falls short of this figure. Consequently

400,000 dairy heifers are required from the calves to be dropped in the next twelve months if dairy cattle numbers are to attain the level required.

The latest census (March, 1943) discloses that the cattle population of Victoria was 2,022,892 head, comprising 1,445,530 dairy cattle and 577,362 beef cattle as follows:—

Dairy Cattle—		
Milking cows	642,111	
Dry cows	235,054	
Heifers for dairying ..	247,374	
Calves under one year old ..	281,512	
Bulls	39,480	
		1,445,531
Beef Cattle		577,362
Total ..		2,022,893

There were 877,165 dairy cows and 235,054 dairy heifers over one year old on the 31st March, 1943, but, by the normal calving time in late winter and early spring, many of these will have been slaughtered or have died, reducing the number to about 1,000,000 cows and heifers and unless something is done about it the number is expected to be about the same next year. In practice an 80 per cent. drop of live calves is quite normal and half of these are heifers, so that to produce 400,000 dairy heifers it will be necessary to rear every heifer in 1944 and again in 1945. There will be some culls certainly, but the need for culling can be reduced to a minimum by feeding the stock better and by adequate attention to their other requirements.

The main points to remember in the hand rearing of dairy calves are:—

1. Select strong, healthy calves from the best cows by good bulls.

2. Provide adequate and suitable feed at regular intervals.

3. Provide clean, warm, dry shelters and runs and fresh grazing free from contamination.

4. The baby calf will respond favourably to the skilled and understanding care of its attendant.

The hand rearing of calves is fully dealt with in the pamphlet "Dairy Calves—Rearing Feeding and Management," which is obtainable free of charge on application to the Director, Department of Agriculture, Melbourne, C.2.

Fire Risk with Nitrate of Soda Bags

WHILE nitrate of soda itself is practically harmless, there is a pronounced fire risk with empty nitrate of soda bags and, in view of the increasing quantities of this fertilizer now purchased, it is desirable to bring this risk to the notice of users. The risk is due to the fact that nitrate of soda on an inflammable material, such as a bag, greatly increases its inflammability as the nitrate supplies large quantities of oxygen to the burning material. For this reason nitrate fires, once started, are difficult to subdue because the exclusion of air by smothering the fire does not extinguish the fire.

Empty nitrate of soda bags may be ignited from a flame or spark or lighted cigarette and in some circumstances by spontaneous combustion. There is a risk, therefore, if the bags are thrown in a heap in an outbuilding or under the house, particularly when they are in contact with other inflammable material. The risk is increased if the bags have been wetted and subsequently dried, as the nitrate is then more evenly distributed throughout the fabric.

Farmers and horticulturists, therefore, are advised to shake all empty nitrate of soda bags free from all obvious particles of fertilizer, and then to wash them in frequent changes of water, followed by a final rinse in clean water. Householders buying nitrate of soda in paper bags or cartons for home garden use are advised to destroy the bags and packets after the fertilizer has been used, and on no account to leave them where matches or cigarettes may be thrown.

[W. R. Jewell, M.Sc., Agricultural Research Chemist.]

PYRAMID HILL PASTURE COMPETITION, 1943

Report by J. A. AIRD, B.Agr.Sc., B.Sc., Dip. Com., State Rivers & Water Supply Commission, and R. H. BEATTIE, B.Agr.Sc., Assistant Agrostologist

Sheep on an irrigated pasture in the Pyramid Hill District. The "Hill" is in the middle background.

IN holding its annual pasture competition during the past war years and again this year, the Pyramid Hill Agricultural Society is continuing in its endeavours to promote better farming methods in the district. There were ten entries in the competition, and the pastures were inspected at the end of October.

The three main factors—irrespective of climate and the natural fertility of the soil—in the improvement of an existing pasture grown under irrigation, are watering, manuring and management. To a large extent these three factors are under the control of the farmer.

At Pyramid Hill, farms are relatively large and water rights are allotted on a basis of one acre-foot per five irrigable acres. Dry farming and irrigated farming therefore are carried on together. Under such conditions Wimmera rye grass and subterranean clover will provide an ideal pasture of winter-growing species, needing irrigation only in the autumn and spring seasons. All pastures inspected were of this type. Although these are annual species they are particularly well adapted to reseeding themselves prolifically and the resulting pasture can be regarded as a more or less permanent one. An example of the expected longevity of such a pasture was seen in a fourteen-year-old pasture on Mr. Campbell's property at Mincha. This pasture was probably one of the first sown in the district and still has the elements needed for a first-class pasture. It provided an object lesson on the potential productivity of the district with the adoption of improved methods.

Evenness of watering is essential in the production of a first-class pasture. The Pyramid district is plain and flat country with relatively flat grades, and some of the land is crab-holey and "difficult." Efficient watering does not mean the indiscriminate flooding of an area. It entails the uniform application of water to the area, and also the draining of any excess water from the pasture as soon as possible. For a watering system to be effective it is an axiom that it must be accompanied by an equally effective drainage system.

Where water is to be applied uniformly, proper grading is necessary; check-banking down the slope is also essential for proper control of the water applied. Grading and check-banking should always be a first requirement in the establishment of a pasture. The pasture is expected to be more or less permanent and should be given every chance at the outset. Some areas may look flat and level enough to give the impression that they can be evenly watered without preparation, but this is a fallacy, and at best, waterings will be haphazard and the pasture a reflection of the method used. In regard to grading, surveys by a qualified person will clearly reveal the existing levels. The State Rivers and Water Supply Commission will help in this regard if requested.

Size of "bay" is important in the control of applied water. Within practical limits the shorter and narrower the "bay" the greater the control. Optimum size of "bay" is a much debated question, but it seems that over most of our irrigation districts a 10-chain run with two-thirds of a chain between checks closely approaches the correct figure. At Pyramid Hill "bays" up to 15 and 20 chains in length, and a little over 1 chain wide, can give a fairly good measure of control, although shortening would lead to improvement. Good watering cannot be expected with bays of half a mile in length.

Large *clean* channels also are necessary for efficient irrigation. The present shortage of labour makes it difficult to take proper care of the reticulation system, but clean channels are a great advantage and a payable proposition, and if possible they should be maintained in this condition.

A prolific growth of Wimmera rye grass and subterranean clover suitable for meadow hay.

The State Rivers and Water Supply Commission has been advocating for some time now the use of permanent structures in farm channels, to enable watering to be carried out more readily and efficiently. These structures are well worth while, and could be used more extensively with advantage. At offices of the Commission, at local centres, there are models and plans of such structures, and sound advice is always available from the officer in charge.

Of equal importance in productivity is manuring. It has been clearly demonstrated that our soils require phosphates to enable them to continue to be productive. It has also been proved conclusively that these phosphates are best supplied as superphosphate. This is the best fertilizer for general farming practice but, unfortunately, war conditions have made rationing of supplies essential.

Top dressing with superphosphate encourages the growth of clovers, and in their turn the clovers build up fertility and enable grasses to grow in association with them, thereby producing a balanced pasture.

The remaining factor, namely, the management of the existing pasture does not always receive the consideration it deserves.

By *management* is meant the control exercised on the grazing that the pasture receives. It entails having paddocks of a size suitable for grazing in rotation and allowing for the proper control of the grazing within the paddocks.

It has been shown in mowing trials that pasture spelled for three weeks to a month between cuts presents a better balanced diet than pasture spelled for shorter or longer periods, and this is the length of rotation advised, except during the spring, when because of the flush of growth it is permissible to shorten the rotation slightly. This will enable a portion of the pasture to be reserved for hay.

The health of the stock is related to the rotation adopted. Digestive disorders are less likely to occur on pasture that has been given time to recover its balance, and in this respect troubles such as bloat and "pulpy kidney" can be kept to a

minimum with a suitable rotation.

The annual rye grass-subterannean clover pasture will be in active growth during autumn, winter, and spring, and dormant during the summer. When the pasture is recommencing growth in the autumn, careful stocking is necessary until establishment is assured. During the dormant period the dry feed and the abundance of clover burr provide good grazing, particularly for sheep.

Mudbanks in channels cause loss of time, labour and earth, and give poor control of water.

During the really active life of the pasture it is advisable to take as much as possible from the pasture, but in the seed-setting stage, the dormant period, and when the pasture is making a fresh start in the autumn, the question is, how much can the pasture be exploited without being damaged and lowered in productiveness throughout the coming season.

"What management should be adopted at the various critical periods during the season?" is not an easy question to answer. Seasons differ and management must vary accordingly. Firstly, the pasture should be kept in high production permanently; apart from the harmful effects of prolonged overstocking these pastures will be most vulnerable at seeding and seedling stages. These periods are of short duration, however, and fortunately some latitude is allowed by reason of the species being particularly hardy and adapted to regeneration. At other times they are well able to look after themselves.

Although a good deal of nutriment can be obtained from the dry residue of the pasture during the summer, a green summer crop is required in addition. At Pyramid, Sudan grass and millet are commonly grown for this purpose. They are good summer fodders and both provide for the deficiency caused by the dormancy of the subterranean clover-rye grass pasture.

Lucerne is not grown extensively in the district although it would appear that this crop could be established successfully on a number of farms. Management is of prior importance in lucerne growing. Irrigation must be uniform, necessitating careful grading and control of the water applied. Small bays are essential; bays of 30 to 40 chains in length are much too long. Lucerne is fairly drought resistant and can stand longer periods of dryness than introduced pasture species. It will not tolerate waterlogging and grows best under good soil conditions. Once established, lucerne is a fodder crop second to none, and with careful management it will persist for some time. 5 lb. of seed per acre should be sown in autumn on graded land and a well-prepared seed bed.

Although some success has been obtained with Rhodes grass and with Phalaris tuberosa, subterranean clover and Wimmera rye grass are the most popular in the Pyramid district. These species fit into the local conditions perfectly. Competitors favoured sowing with a cover crop, but others did not adopt this method. With this type of pasture sowing under a cover crop is permissible and may be good practice.

There are different strains of subterranean clover which have been developed under different sets of conditions and remain suited to these conditions. The "Tallarook" strain is recommended for growing under irrigation as is has a long growing period, and is therefore, able to take advantage of late spring irrigation. It is claimed that "Tallarook" strain can be kept in active growth for 10 months of the year. The original subterranean clover of commerce was the "Mt. Barker" strain, and it is this strain which is found most extensively in pastures, but where new areas are being sown the "Tallarook" strain, Government certified as to type, is recommended.

Mr. R. H. Mills was adjudged the winner of the competition for an excellent 15 acres of pasture in its 3rd year. Mr. Mills has 100 acres of improved pasture given to the production of fat lambs. The entry of 15 acres was typical

of all this competitor's pasture. The policy adopted by Mr. Mills has always been to sow his pastures under a crop of barley or oats, and the success of the method is reflected in his pastures. An outstanding feature of the winning pasture was its freedom from weeds.

Mr. A. J. Broad was awarded 2nd prize for a productive paddock of 15 acres. This paddock was sown in autumn, 1940, with 5 lb. of subterranean clover and 10 lb. rye grass per acre without a cover crop. For his enthusiasm and initiative as an irrigation farmer, Mr. Broad is to be commended. His dairy herd is worthy of mention if only to show the productivity of the farm. The herd now consists of 12 grade cows and 14 registered Jerseys, the latter continually under Government test. During the first year of testing, Mr. Broad's herd was 6th in order of merit for herds of 10 to 14 cows, with a herd average with allowances of 464·2 lb. butterfat, for 273 days. During that time good records were made by individual cows. In September of this year, the cow "Lynlea Pearlina 2nd," on her second calf and on her first test, produced 64·8 lb. butterfat for the 30-day period. Mr. Broad has also obtained some very good prices for lambs fattened on this season's pasture.

Messrs. C. E. Wood and Sons were placed 3rd, with an entry of 23 acres sown in April, 1942, under oats. Four years ago the area was tried, unsuccessfully, with wild white clover.

The seeding per acre was 2 lb. subterranean clover, 5 lb. rye grass and ½ bushel oats. The seed sown with the topdresser was first scarified into the soil. The pasture would yield well, but had too much trefoil in it to rank highly for composition. This farm is well managed and used solely for dairying.

Fodder reserves are a valuable asset even in an irrigation district.

PASTURE COMPETITION AWARDS, PYRAMID HILL DISTRICT, 1943.

Name of Competitor.	Layout of Land for Irrigation. Condition of Channels and Drains.	Composition of Pastures.	Condition of Pastures.	Uniformity.	Freedom from Weeds.	Total.
Name of Competitor	20	20	20	20	20	..
R. H. Mills	13	15	17	18	19	82
A. J. Broad	12	16	15	18	13	74
C. E. Wood and Sons ..	13	11	15	16	14	69
J. N. Wood	13	12	15	16	10	66
J. H. Hercus	11	14	15	14	12	66
D. Campbell	10	14	16	12	14	66
L. Malone	15	12	16	14	8	65
A. Cameron	11	12	16	14	11	64
S. Spowart	14	12	16	10	11	63
W. Young	11	12	12	12	10	57

Weed Control in Carrot Crops

A Preliminary Note and Warning

By Officers of the Horticultural Division

THE Department of Agriculture has been experimenting in Victoria with a method of weed control in carrot crops developed recently and used successfully in the United States of America. Briefly the method consists of spraying the crop with certain oils which destroy the weeds, but leave the young carrot plants undamaged. In Victoria, the most satisfactory oil appears to be power kerosene.

The experiments are not yet complete, but carrot growers are manifesting such an active interest that it is necessary to warn them of the pitfalls into which they may stumble if they use the method without full knowledge of the procedure. Pending the completion of the investigations, full details cannot be given, but the following information is offered as a general guide. As soon as possible, a detailed account of the method will be given.

The Selective Spray

Power kerosene used neat has proved to be a satisfactory selective spray, killing all kinds of weeds and grass so far encountered, and causing little or no damage to the carrots.

WARNING.

A sample from every drum of power kerosene used for weed control in carrot crops should be tested on a few feet of row before the remainder is used on the crop. If no damage to the carrots appears within 24 hours, the kerosene may be judged satisfactory. Owing to war conditions, imported power kerosene varies greatly in its selective action. Some supplies in Victoria have been found to damage carrots seriously. The distribution of the supplies cannot be checked. There is no simple way of detecting unsuitable kinds except by a small field trial. As far as can be judged, the bulk of the kerosene in Victoria at present appears to be satisfactory in its selective action, but, until the Department arranges a means by which safe kerosene can be distinguished in the drum, *every drum* should be tested before use.

NOTE:—Lighting kerosene is not effective. "Distillate" or deisel oil damages carrots as well as weeds.

The power kerosene-sprayed plot on right shows complete destruction of the weeds without damage to the carrots.

When to Spray

Spraying may be done after the carrots have developed two true or "fern" leaves, and at least three months before the crop will be ready to harvest.

WARNING.

(1) Carrots sprayed before the two-leaf stage will be seriously damaged.

(2) Carrots sprayed within three months of harvest will have a flavour of kerosene which cannot be removed. Such carrots will not be accepted by the Government.

The exact time to spray is determined by the growth of weeds and carrots, but should be about the four-leaf stage. The greater the amount of growth, the greater the quantity of kerosene required and so the greater the expense. Further, weeds become more resistant to the spray as they grow older. For the present, growers are advised not to spray in the heat of the day.

Equipment

A knapsack spray is suitable for small to medium areas. Spraying can be done with it at a moderate walking pace. Various adaptations of orchard power sprayers and attachments to tractors can be used for larger areas. At present, a nozzle delivering a fan-shaped spray appears to be more effective than one delivering a cone-shaped spray. A fine, misty spray gives good coverage and is economical of kerosene.

Knapsack spray pumps cannot be purchased at present, but efforts are being made to have them manufactured for this purpose.

How to Spray

Where rows are more than 12 inches apart and where the rows of carrots can be seen easily, first the weeds between the rows can be destroyed by cultivation, then the remaining strips can be sprayed to kill the weeds in and near the rows. If the rows of carrots are obscured by weeds, it is necessary to spray the whole area, or to spray along the rows by hand, later cultivating between the rows when the weeds have wilted and exposed the still-green carrots. Where rows are less than 12 inches apart, the cheapest way is to spray the whole area.

Quantities of Spray Required

The quantity of power kerosene required depends upon the amount of weed growth and the method of spraying. For the strip spraying of carrots in 18-in rows, 20 to 40 gallons per acre may be used. When the whole area is sprayed, up to 80 gallons per acre may be used.

WARNING.

Too little spray will not destroy the weeds. Heavy spraying will taint the carrots for a longer period, and, besides, is uneconomic. Use as little spray as will give a good coverage of the weeds.

Economics

Weed control by spraying and inter-row cultivation requires much less labour than hand weeding, but is still a fairly costly operation. Thorough soil preparation before planting will reduce the weed population, and make the operation easier and less costly. Spraying may not completely eliminate hand weeding, and will not do way with the necessity of thinning the crop. Generally it will reduce the labour required for weed control in the crop to one-fifth, or even one-tenth, of the amount usually required in weedy country.

Control of weeds by spraying allows the whole of the weeding to be done at the right time, instead of being spread out over days or even weeks. Carrots in which the weeds have been destroyed by spraying will soon outstrip in growth carrots which have been hand weeded.

Power kerosene is imported at the risk of seamen's lives; therefore growers who use it for weed control should do so with the utmost economy consistent with good results.

Prices of Hay and Chaff

The Commonwealth Prices Commissioner (Professor D. B. Copland) has announced that he had received many inquiries from farmers in Victoria regarding the proposed prices of hay and chaff for the coming season. Crops were ready to cut and farmers were anxious to know the position before deciding whether they would cut for hay or allow the crop to ripen for grain. Professor Copland said that it was not proposed to make any alteration to the existing ceiling prices which will continue during the coming season. These ceilings were fixed in June last when a fodder shortage was threatened and when prices were relatively high.

Entero-toxaemia of Sheep

(Pulpy Kidney)

By J. W. EVANS, B.V.Sc., Veterinary Officer.

ENTERO-TOXAEMIA, also termed "pulpy kidney" in lambs, is an acute infectious condition of sheep, caused by a specific germ. This organism *Clostridium welchii*, type D, rapidly multiplies in the small bowel of sheep and produces a powerful toxin or poison which being absorbed from the bowel, kills the sheep. The majority of outbreaks are associated with high rainfall areas where cultivation, top-dressing and better types of grasses have resulted in improved pasture conditions. On rough or bush country, outbreaks occur only rarely.

In Western Australia, losses probably occurred from this disease as early as 1915 in the Beverley-York district, following a period of increased agricultural activity. From that time the disease became widespread in that State, causing heavy losses. It was not until about 1932, that entero-toxaemia was shown to be a seperate disease, and quite distinct from Black disease, which had been described previously in New South Wales and Victoria. At that time, also, the disease of lambs, termed "pulpy kidney," in Tasmania and New Zealand was shown to be identical with entero-toxaemia in Western Australia.

Occurrence of Outbreaks

The majority of outbreaks of entero-toxaemia occur between April and October, coinciding with that period of the year when green feed is available. The severity of outbreaks varies from year to year, and from district to district. A property may sustain a heavy loss one year and have no trouble the next season, although sheep may be dying on adjoining farms.

Sheep affected with infectious entero-toxaemia (comatose type) half an hour before death.

The greatest losses occur during seasons of heavy rainfall when there is an abundance of green feed. In many cases, deaths commence shortly after the first rains and continue at irregular intervals until the feed dries off. Although the loss is intermittent in nature, the mortality, by the end of the season, may reach serious proportions.

In some cases deaths do not occur until August or September, but the total losses may be quite heavy before the mortality ceases with the drying off of the feed.

Although most losses from entero-toxemia occur during the season of good rains and green feed, outbreaks may also occur when sheep are on dry feed. Such losses are frequently associated with sheep eating flowering stinkwort, which is apparently a pre-disposing cause of the disease. In these cases, mortality occurs during late summer and autumn, when feed is scarce and the plant is freely eaten. Deaths at this time of the year are most likely to occur when the summer has been very dry and the autumn rains are late.

Outbreaks of entero-toxaemia have also occurred during the summer months among sheep feeding on peas, on wheat crops which, owing to storm damage or poor yield, have not been harvested, and on concentrates. This type of mortality occurs only rarely.

Type of Sheep affected

Sheep of all ages and breeds are susceptible, although heaviest losses occur in lambs. Deaths may commence when the lambs are two weeks old or even younger. Frequently, no loss is experienced till the lambs are about ten weeks old. Deaths may occur concurrently in both sheep and lambs on the same property, or the losses may be confined to lambs, or to sheep. When mortality occurs in lambs, usually those most forward in condition succumb.

From year to year, on any property, the severity of outbreaks varies. Where the disease occurs for the first time, losses are usually heavy, but in subsequent seasons the mortality may be less. In those areas where the disease is endemic, the death rate is usually low, except amongst newly-introduced flocks or young lambs. Fat sheep are most frequently affected, particularly in outbreaks occurring during the "flush" season, but in outbreaks occurring during the dry weather, the condition of affected sheep is frequently fair or even poor.

The Specific Cause

As previously stated, the specific cause of entero-toxaemia is a rod-shaped micro-organism, *Clostridium welchii,* type D. This germ occurs very frequently in cultivated soils, and is able to persist for long periods by the formation of spores. As it occurs so widely, the organism must frequently be ingested by sheep during grazing, but under ordinary conditions it passes through the sheep's bowel without ill effect.

When conditions favour its growth, the organism rapidly multiplies in the small bowel of the sheep, and produces the toxin, the absorption of which causes the animal's sickness and death. It is known that a sluggish bowel favours the growth of the organism. Experimentally it was found impossible to kill sheep with this disease, unless the movement of the bowel had been rendered sluggish by the use of certain drugs. How this particular condition of the bowel is brought about in sheep under natural conditions is not clearly understood. It is known however, that certain conditions of feeding pre-dispose towards the disease, and it is believed that these conditions bring about the temporary stasis of the bowel which is necessary for the appearance of the disease.

Predisposing Causes

Green feed and **diminished exercise** are two factors which are important pre-disposing causes.

Green feed is low in fibre content, especially when young and lush. Under "flush" conditions of feeding, the sheep does not need to move far to obtain its food requirements, hence exercise is diminished. Both exercise and the fibre consumed are powerful stimulants to increased bowel activity. The greater the quantity of fibre in the feed, the more powerful is peristalsis (bowel movement). When either fibre or exercise is decreased or lacking, peristalsis is more or less diminished and conditions within the bowel are favourable to the development of the disease.

The fibre-content of peas, grain, and concentrates generally is low, hence sheep feeding on these would suffer from decreased fibre intake and resultant bowel activity, and would similarly be pre-disposed.

Sheep affected with the convulsive type of entero-toxaemia—one hour before death.

Injury to the bowel wall is considered another pre-disposing cause. Sheep which die from entero-toxaemia when feeding on flowering stinkwort are found on post-mortem examination to have many of the seeds of the stinkwort attached by their barbs to the bowel lining. This injures the bowel wall and pre-disposes to the disease.

Symptoms

As the period of sickness is, in most cases, only a matter of hours, affected sheep or lambs are usually found dead in the paddocks or close by their camp in the morning. If a flock containing sick sheep be driven, the sick ones tend to lag behind, and may show symptoms after this forced exercise.

Symptoms may be either of two kinds, one characterized by coma and quiet death, and the other by convulsions.

In cases where coma precedes death, the initial stages are characterized by staggering gait and "knuckling over." The head is held low to the ground and the sheep may pick up and chew sticks and dirt. It soon lies down and, if disturbed, is unable to rise and move with certainty. Salivation and champing of the jaws are common signs, and there is tenderness in the region of the flank. The head may be turned round to the flank. Very rapid, shallow breathing is seen, and is soon followed by blindness, coma, and death in three to four hours. In rare cases death may be delayed for 24 hours or even longer.

In other cases, particularly in lambs, the animal is slightly dull, suddenly staggers, goes down and has convulsions. The eyes roll, the muscles twitch and, while down, it makes galloping movements almost up to the time of death which occurs two to four hours after the onset of symptoms.

The convulsive type is seen more commonly in lambs; adult sheep tend to become comatose.

Post-Mortem Appearances

If an animal on the point of death be killed and the carcass examined immediately, few abnormal changes will be seen. The subcutaneous vessels may be slightly congested. The first three stomachs are normal, although the paunch may be tympanitic (distended with gas). The fourth stomach and small bowel may show areas of slight congestion. Usually there is marked congestion of the mesenteric vessels which supply the small bowel. This latter is frequently somewhat tympanitic, and contains less fluid ingesta than that of a normal sheep.

The liver may be slightly congested, friable and blotchy in appearance. The kidneys may show areas of congestion and be paler and softer than is normal.

In the thoracic cavity the chief features seen may be an excess of clear straw-coloured fluid in the pericardial sac surrounding the heart. There are usually numerous small haemorrhagic areas on the outer surface of the heart muscle and, if the ventricles be opened, more of these haemorrhagic areas are seen under the lining of either ventricle.

Putrefaction of sheep affected with entero-toxaemia is rapid. Within a few hours, the carcass is blown and the skin is blue. Frequently there may be a blood-stained discharge from the nostrils and anus. Tissue degeneration is rapid; the kidneys, within an hour or so, are frequently quite dark, softened and pulpy. This characteristic appearance of the kidneys led to the adoption of the term "pulpy kidney" disease.

Diagnosis

In the field, diagnosis of the disease can be fairly determined on the history of the mortality and on the post-mortem of dead sheep, if the examination be carried out shortly after death. In the laboratory, the diagnosis of entero-toxaemia can be definitely confirmed by testing the contents of the small bowel. Microscopic examination of the material will show the presence of the causal organism in countless numbers. Again, if the bowel contents are passed through a filter which holds back all bacteria, and a portion of this filtrate is injected into a small laboratory animal, this animal will die in a few minutes. Similar material, from healthy sheep or sheep sick from some other cause, will not produce this result.

In order to collect small bowel contents for laboratory diagnosis, the following procedure should be adopted. First tie off the small bowel at its junction with the fourth stomach and where it joins the caecum. Then free the small bowel from its mesentery. Then by drawing the bowel between thumb and finger, the contents are forced to one end whence they can readily be transferred to a suitable glass jar or other container. As a preservative, a few drops of chloroform (0·5 cc. per 100 ccs. of bowel contents) should be added. Suitably packed, this material should be forwarded as soon as possible to the Director, Veterinary Research Institute, Parkville, to obtain a definite diagnosis.

Control

Various methods were used in attempts to control the disease prior to the time when entero-toxaemia could be controlled by vaccination. Of these, the more successful provided more exercise and/or more fibre in the ration.

Moving sheep frequently from paddock to paddock provided more exercise, toned up the bowel, thereby increasing peristaltic action.

Transferring an affected flock to scrub or bush country tended to check mortality by providing more roughage in the ration, but was unsuited to the production of fat lambs or wool.

Feeding supplements such as hay, chaff, &c., high in fibre, increased the bulk of the ration and tended to check mortality. Of all these methods, however, none was reliable as a method of control and none was satisfactory to the production of good fat lambs.

Although inoculation with entero-toxaemia vaccine is not effective in every case, it has been, hitherto, the only method to give any practical results. Two types of vaccine are prepared by the Commonwealth Serum Laboratories; these have proved most effective on many properties.

With one type of vaccine the treatment for lambs consists of the injection of two doses of 5 cc. at an interval of four weeks. For adult sheep the first dose should be 5 cc. and the second 10 cc. On properties known to be infected, young lambs should be given the first dose as soon after birth as possible. If this is done, full immunity is established by the time the lamb is seven weeks old.

With the second type of vaccine, known as "Entero-toxaemia Vaccine, Alum-precipitated," a single dose of 5 cc. is injected; this is sufficient to confer immunity, and only when a heavy death rate is expected is it recommended that a second dose be given after an interval of one month. This latter type of vaccine causes a lump at the site of injection which usually persists for some time. It may cause a blemish to the dressed carcass. Therefore, it is recommended that export lambs be inoculated where such a nodule will not blemish the carcass. The skin on the inside of the knee is sufficiently loose to be a satisfactory site for inoculation. Similarly, another suitable site is beneath the skin close to and behind the base of the ear.

When it is desired to protect young lambs against entero-toxaemia by vaccinating the ewe during pregnancy—and sheep owners are recommended to adopt this procedure—one dose of 5 cc. of the alum-precipitated type of vaccine should be injected at or about the time of mating and a second dose of 10 cc. about a fortnight before the due date of lambing. As the immunity of the ewe is transferred to the lamb in the colostrum or "first milk" it is important that lambing should occur at the time of greatest response to the second dose of vaccine. As the maximum response occurs ten to fourteen days after the injection it follows that the ideal time to give the second dose is ten to fourteen days before lambing. By this method, the lamb acquires an immunity which is described as "passive," in that the immunity lasts for a period of three or four weeks only and then rapidly declines.

Prophylactic Inoculation

The inoculation of vaccines has not always been effective. After vaccination, a period of ten to fourteen days must elapse before satisfactory immunity is acquired and a concurrent mortality ceases. During this period severe losses may be sustained. At present, limited field trials are being carried out to test the value of prophylactic inoculation of lambs with an anti-toxin serum which, it is considered, may produce an immediate passive immunity and protect the flock during that period over which the mortality occurs.

Measures to Adopt

In the event of an outbreak of entero-toxaemia, the following measures should be undertaken:—

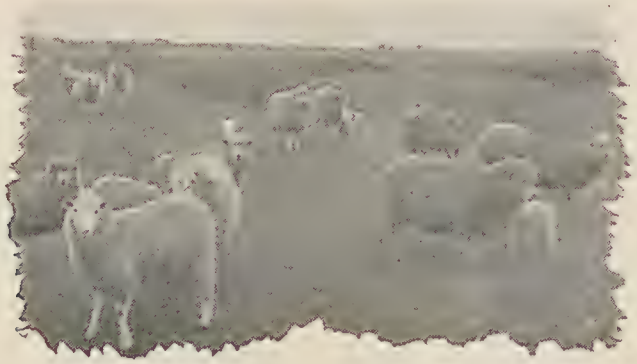
1. Vaccinate the flock with E.T. alum-precipitated vaccine. This should produce an immunity in ten to fourteen days sufficient to control the disease.

2. Meantime move the sheep about, and provide them with a supplement such as hay, chaff, &c.

3. Where mortality continues, vaccinate again in three to four weeks.

4. Bury deeply or burn completely all carcasses of sheep which have died of the disease.

Full directions for inoculating sheep and the precautions to observe are contained in an article published in the November issue of the Journal.



Fruit Quality in the Shops

Suggested Use for a Ripening Chamber

By G. B. TINDALE, B.Agr.Sc., Cool Storage Research Officer

When fruit is destined for distant markets it is not practicable to harvest it in a ripe condition. Consequently, such fruit must be picked while still immature. Unfortunately, this pre-mature harvesting involves a considerable loss in the eating quality of fruit, even though its appearance may be excellent. The writer of this article, however, describes a method whereby this loss may be largely offset. He suggests, where turnover warrants it, the installation in retail fruit establishments, of a double chamber, one held at a temperature of 65° for ripening immature fruit, the other at 40° for retarding ripening when the demand for a particular fruit is not heavy, and also for the the storage of perishable vegetables and fruits, especially over hot week-ends during the summer months.

THE wide range of climatic and soil conditions existing in Victoria permits the growth of a large variety of fruits. In the cooler elevated districts berry fruits, cherries, and nuts thrive; in most parts apples, pears, plums, peaches, nectarines, apricots and lemons flourish, while in the warmer northern area, grapes, oranges and olives are produced abundantly.

These fruits ripen to perfection in the districts where they are grown, but the consumer purchasing from the city shop seldom can obtain them in anything approaching perfect condition. On the contrary, the eating quality of much of the fruit offered for sale is poor, even though it may be of excellent appearance and free from blemish. The reason for this lack of eating quality however, is not hard to seek. Most fruits are grown in districts far removed from the city and have to withstand numerous handlings between picking and ultimate disposal to the consumer.

It would be quite impracticable to leave fruit to ripen on the tree and then pick it for the city trade, for fruit when fully ripe would be too delicate to withstand the necessary handlings between orchard and shop; indeed soft fruits so picked would be "running out

of the case" before they reached the retailer's hands. Hence most fruit is picked when more or less fully grown, but before the ripening processes have proceeded very far. The fruit is then sufficiently hard to withstand the normal handlings associated with marketing, and while a certain amount of softening and ripening takes place subsequent to picking, yet the flavour and lusciousness which ultimately develop are poor compared with those of the tree-ripened fruit.

In view of this necessity to pick fruit in the immature condition when intended for distant markets, it would appear that the consumer must be satisfied with the consequent poor eating quality so evident to-day. Such, however, is not the case.

The Ripening Chamber

Of recent years much research work has been carried out on the storage and ripening of Victorian-grown fruits, and the object of this article is to indicate a proved method whereby the retailer can "condition" or ripen fruit picked immature (as at present) to a condition of excellence seldom surpassed even by that of tree-ripened fruit.

It has been found that there is a rather narrow range of temperatures over which fruits, picked immature, will ripen to perfection. The range is from 60° to 70° F., while a constant temperature of 65°F. is suitable for practically all our fruits. When placed at that temperature, most fruits will gradually develop a really surprising degree of lusciousness and flavour, the time taken to ripen ranging from three days to a week, depending on the stage of maturity of the fruit.

The equipment needed to so ripen fruit would consist of an insulated chamber or small room equipped with refrigeration for keeping temperatures down to 65° during the summer months, and heating for keeping temperatures up to 65° during the cooler months. Wherever electricity is available both the cooling and heating may be carried out automatically, while practically no technical ability is required to operate the equipment. (Incidentally, automatic cooling chambers are more or less general now in butchers' establishments.)

The fruit retailer using this method for the controlled ripening of fruit could stop the ripening processes if he so desired, (as for instance, during a sudden, cold spell in summer when the demand for ripe peaches would be diminished). By the use of a double chamber, the first half kept at 65° for ripening, the second half at 40°, the retailer could stop the ripening processes by transference of the fruit from the chamber with the higher temperature to the one with the lower. In addition, the cooler chamber would serve other extremely useful purposes as will be described later.

With the double chamber, the retailer could offer to the consuming public all through the summer months, peaches, nectarines, plums, apricots, and pears (early varieties) in a firm but fully ripe condition, luscious, and of good flavour. During the cooler months of the year the better quality later maturing varieties of pears could be ripened to perfection. As yet the Melbourne public scarcely realizes how delicious a properly ripened pear can be. From April onward Melbourne temperatures are too cold for pears ex cool store to ripen normally, and consequently there is little demand for them, except for culinary purposes. More recently the controlled ripening of pears (at 65°) has been adopted commercially at some of the country cool stores, with good results. Even better results would be obtained, however, if the pears were ripened by the retailer, for he could ripen them considerably nearer to full ripeness than the country operator who really only partly ripens the pears so that they may subsequently be handled without bruising.

While discussing pear ripening, it is worth mentioning here that immense quantities of Williams' Bon Chretien pears are now subject to controlled ripening at 65° prior to canning in Victorian canneries. Pears are picked for canning while still hard and green, and then cool stored until the cannery can process them. About a week previous to canning the pears are removed from cool storage and subjected to controlled ripening at 65°, when they gradually turn yellow and ripen with most excellent flavour and lusciousness. Before controlled ripening was introduced, results were far from satisfactory. In cold weather little ripening took place, while if it were hot, the pears would tend to become mealy, lacking in both flavour and juice. Now, however, the quality of the Victorian canned W.B.C. pear is world renowned.

The Cool Chamber

Mention has been made of uses for the cool chamber other than that of arresting ripening processes. During week-ends, in the summer months, there is often considerable wastage

in fruit shops due to the carry-over fruit becoming over-ripe and wasty. With a cool chamber on the premises this wastage could be entirely avoided.

During hot weather, deterioration in vegetables is very rapid, the vegetables quickly becoming wilted and stale and hence depreciating greatly in value. Such depreciation could be entirely avoided by keeping the bulk supply of vegetables in the cool chamber, and placing limited quantities only on display.

So far the advantages outlined for the installation of a ripening and cooling chamber have been in connexion with the summer fruits and vegetables. It may be asked of what use would the equipment be for the rest of the year. Pears ex cool store are available now nearly all the year and, as stated above, an opportunity exists for the ripening of this fruit throughout the cooler months of the year. Then there is the subject of tropical fruits from Queensland, including, of course, the ever-popular banana. These tropical fruits are transhipped in the firm immature condition and the ripening processes more or less proceed after the fruits arrive in Victoria. These fruits, however, only develop good eating quality when ripened at the optimum temperature which approximates to 65°. When no attempt is made to control the ripening of these tropical fruits (at say 65°) the eating quality which ultimately develops is usually so poor that it is impossible to create a demand for the fruit. With ripening facilities on the premises of the retailer, it would naturally follow that a demand for the fully-flavoured, ripened, tropical fruits would soon grow. Tropical fruits could be made available throughout most of the year under these methods of handling.

The cool chamber could be put to excellent use throughout the whole year in connexion with the selling of apples. Apples are picked during the late summer and autumn and then placed in cool storage, the market being "fed" from cool storage throughout the remainder of the year. While in cool storage, the life processes are greatly slowed down, but not entirely stopped, so that as the months pass there is a gradual loss in flavour and crispness. The loss, however, is greatly accelerated after the apples are finally removed from cool storage and placed at the higher "shop" temperatures, while awating sales. It is for this reason that during the latter half of the year, while the eating quality of apples immediately on removal from cool stores is mostly quite good, the eating quality of apples purchased from shops is generally poor.

If the retailer is able to hold apples in his own cool chamber while awaiting sales, merely displaying baskets of apples instead of case lots, he will be able to retain in the apples most of the flavour and eating quality which, under present methods of selling, are rapidly lost.

While there are no doubts as to the great benefits which could be derived by the installation of a combined ripening and cooling chamber, whether it would pay a retailer to install one or not, would depend largely on his turnover. Where the turnover is small the savings and benfits to be derived would not warrant the cost of such an installation.

A leading firm of refrigerating engineers was good enough to prepare an estimate of costs to supply and erect a double insulated chamber, each compartment 10 x 5 x 8 feet high, and each compartment fitted with both cooling and heating apparatus, so that the temperature could be automatically controlled either for ripening (65°) or for cold storage (40°). The estimated cost of the double chamber itself was £250 while that of the refrigeration machinery, heating apparatus, and automatic controls was £350, making a total outlay of £600. The annual costs would approximate as follows:—

	£
Interest—5 per cent. on £600 ..	30
Depreciation—4 per cent. on £250 ..	10
Depreciation—10 per cent. on £350 ..	35
TOTAL ..	£75

Running costs would depend on the quantity of fruit handled, but it is estimated that it would approximate to £50 per annum. Thus total annual expense (overhead plus operating costs) would amount to £125.

Where turnover exceeds £1,000 per annum, it would seem that the installation of the cool chamber would pay for itself by the elimination of over-ripe and wasty fruit and stale vegetables, in which case the benefits to be derived by being able to supply in addition fruit in a perfect state of ripeness, should be reflected in much greater turnover for the public will ultimately go to where it can purchase the best article.

In conclusion, it might be mentioned that the proposal isn't quite novel, for already one or two of the highest class fruit shops in Melbourne adopt methods more or less on the suggested lines, and the quality of the fruit they offer for sale is a by-word among discriminating fruit purchasers in the city.

War Agricultural Committee Notes

Compiled by THE CENTRAL EXECUTIVE

THE lack of man power on farms, due to the large number of young men who left the country districts to join the Services and to engage in munitions industries, has been one of the outstanding features of this war. This drift has been checked, but the replacement of the labour lost has not been possible. It has, therefore, become necessary to increase the facilities for mechanization of farming. The Commonwealth Government has taken steps to ensure that the agricultural machinery will be available for farmers by drawing up a programme of local manufacture and by importing those machines which cannot be made here from the United States of America, under the Lease-Lend Agreement. The manufacture of agricultural machinery has now become a munition project, and factories have been diverted from the manufacture of implements of war to implements of agriculture.

To aid the farm mechanization programme, it is desirable to ensure that new machinery is put to the most profitable use. On 19th June, 1943, therefore, National Security (Agricultural Machinery) Regulations were promulgated to control the manufacture and distribution of all new agricultural machinery. A controller of Agricultural Machinery has been appointed, whose headquarters are in Sydney, and the State Departments of Agriculture act as his deputies in all States.

It has been found difficult to draw a dividing line between agricultural machinery and machinery for secondary industries; therefore, co-operation is essential between the Controller of Agricultural Machinery and the other Government Departments controlling machinery. It has been found advisable to exclude pumps of all types, electric motors, and a few other machines from agricultural machinery control for this reason.

The procedure for obtaining the release of machinery is set out hereunder and falls into two Controls namely "A" and "B"—

(*a*) *Control "A."*—Includes all agricultural machinery not specifically mentioned as under Control "B" except pumps, electric motors and a few minor machines. An application on Form "A" is lodged by the farmer, when placing an order with the machinery agent, who certifies to the essentiality.

(*b*) *Control "B."*—Includes internal combustion engines; rotary hoes; irrigation outfits; jetting plants; cream separators; shearing machines, and conversion brackets; comb and cutter grinders; orchard spray outfits; tractors —all types; windmills; and any other machinery for the functioning of which an engine is built in or is an integral part.

Under this control the farmer lodges a firm order with his supplier and submits an Application Form "B," which must be signed by him and contain answers to all questions indicated for his attention to the chairman of the nearest Local War Agricultural Committee for certification. The form is then channelled through the Regional Office to the Central Executive, War Agricultural Committee, V.C.A. Building, 1 Collins-place, Melbourne, C.1. If the application is approved, a written permit authorizing the supply of the machine will then be issued by the Machinery Officer. A copy of the permit will be sent to the applicant.

A statement on the application form setting out fully the purposes for which the machine is required greatly facilitates the issue of the permit, and farmers are advised to supply this.

Tractors

Tractors represent an important part in the farm mechanization plan as well as in the equipment necessary for the modern military machine. This latter has caused many machines which would normally find their way on to farms to be diverted to the needs of war. The number of new tractors available for agricultural use has, therefore, been few, and it has been necessary to see that these machines are sold to farmers who will put them to the best use.

Under the agreement by which these tractors are imported from U.S.A., it is the responsibility of the Australian Government to assure America that all machines shipped to this country are being fully used for essential work.

All this has necessitated a rigid control over the transfer of tractors, both new and second-hand, so that essential agricultural users shall not be hindered in their mechanization plans. For this reason tractors of all types, new or

second-hand, have been brought under Control "B" of the National Security (Agricultural Machinery) Regulations. The following procedure should be followed by farmers wishing to purchase a second-hand tractor:—

After satisfactory arrangements have been made between the buyer and seller, the former will complete an Application Form "B" fully and lodge it with the Local War Agricultural Committee for certification as to essentiality. This will be forwarded to the Central Executive, War Agricultural Committee, in the usual way, and if the sale is approved a written permit will be issued. It should be firmly understood that the completion of an Application Form "B" or the issuing of a permit in no way constitutes a legal agreement compelling the owner to sell.

Sales of tractors by auction must be announced by the auctioneer as "subject to the transfer being approved," and the purchaser must make an application on Form "B" for a permit to purchase such tractors in the usual way. All tractors and earth-moving equipment are controlled by the Allied Works Council, and these implements cannot be transferred or sold by the owners without authority. In the case of tractors, the State Machinery Control transfers farmer-owned tractors from one farmer to another on behalf of the Allied Works Council.

Other second-hand agricultural machinery is not under control.

Pumps

All pumps, hand or power operated, are controlled by the Directorate of Materials Supply, 532 Bourke-street, Melbourne, C.1., and applicants should lodge an order with machinery supplier and forward a copy, together with a statement showing the purpose for which it is to be used, to the above-mentioned Directorate for a release.

Electric Motors

Application for release of electric motors should be made to the Directorate of Machine Tools and Gauges, 499 Little Collins-street, Melbourne, C.1., on a special form obtainable from the Directorate, or the distributors. The purposes for which the motor is to be used also must be shown on the form. An order for the motor may be placed before or after lodging the application to enable buyers to order from a firm able to supply.

Prisoner-of-War Mail to be Sent Direct

Letters and postcards to Australian prisoners of war and Australian internees in enemy hands must in future be addressed direct to the prisoner at his place of internment, and not sent through the Australian Red Cross Society.

Correspondence should show in full the latest camp address of the prisoner and the name of the country of internment.

The change in postal direction of prisoners' mail, which was announced by the Prime Minister, Mr. Curtin, has been made to conform to the requirements of the Japanese Government and to establish a uniform method of addressing mail.

Only relatives and close friends of prisoners should write letters, which should be short and not be sent too frequently, as delays occur in enemy censorship if letters are too long and too numerous. The text of letters to prisoners in Japanese hands should not exceed 25 words and should be typed or written in block letters.

The decision to send letters direct to prisoners without reference to Red Cross was taken at a conference between the Australian Red Cross Society and Government departments. The Secretary-General of the Society, Captain A. G. Brown, pointed out that the work of the Red Cross letter department had familiarized the public with mail regulations. It was realized that letters could now safely be posted direct, if correspondents followed instructions carefully.

To facilitate the change-over to the new system, the Australian Red Cross Society is printing leaflets of postal regulations, and supplying letter folders free of charge to the public. The catalogue of prisoners' names and addresses at National Red Cross headquarters in Melbourne would be kept intact after the letter department closed down and any details of address would be available on application to Red Cross. Red Cross would also continue to type letters for any one unable to do so themselves.

The next-of-kin parcels system will not be affected. Next-of-kin must still address parcels through the Australian Red Cross Parcels Department, 122-128 Flinders-street, Melbourne, C.1.

[Australian Red Cross Society.]

Live Stock Notes

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

Rearing Calves on Foster Mothers

THE manpower shortage is one of the most serious problems with which the farmer has to contend. It has tested his ingenuity in discovering expedients whereby he can, to some extent, overcome the labour deficiency and keep his farm at a payable level of production.

One of his greatest difficulties is to reduce the time spent on tedious but necessary tasks such as calf rearing, and in this connexion a method adopted by Mr. C. A. Boyes, a Wodonga dairy-farmer is worthy of attention.

In 1941 when the labour problem first came under serious notice Mr. Boyes was faced with the task of handling a herd of over 70 stud Jerseys cows and all the other farm work with his wife as his sole assistant.

Calf rearing is a task requiring the skilled and understanding care of the owner or attendant, in addition to a lot of patience and time, when one is anxious to get breakfast and start the outside work after the morning milking, or tired and anxious to knock off after finishing the evening milking.

To cope with the situation, Mr. Boyes selected ten nurse cows, and gave each cow four heifer calves to rear. The calf belonging to each nurse cow was removed and fostered by another cow. The foster mothers needed some watching and attention for a few days to ensure that they took kindly to the calves, after which they were turned on to pasture. The cows were hand fed in the same manner as the milking herd, but otherwise neither cows nor calves gave further trouble. In the following year 36 heifer calves were reared on nine cows, and a few bull calves also were reared by this method. This year 44 heifer calves and a few bull calves have been reared similarly.

This dairy farmer is so pleased with his experiment in calf rearing that he would not consider rearing calves in the usual way again. The calves have done better and, in addition, their owner has been saved the labour of bucket feeding, and of milking their mothers.

The heifers reared in 1941 are now being milked, and have been as quiet, if not quieter, to handle than heifers reared on the bucket. This is attributed to the fact that bucket-reared calves unavoidably receive rough treatment at times, and learn tricks.

The heifers are well grown, and are milking splendidly.

Mr. Boyes has already weaned this year's calves. He arranges for his cows to come in early, and finds that calves weaned while the pastures are still good do much better than calves weaned after the pastures have dried off.

The weaning is simple. Normally the calves are left in the paddock, when the nurse cows are brought in to be fed. When the calves are to be weaned, the nurse cows are brought in to be fed, and then turned out with the milking herd, being milked from then on until the end of their lactations. The foster mothers are more upset at weaning than the calves, but after two or three days they settle down, when it is found that the foster mothers are giving as much milk as their herd mates which have been milked right from calving.

Some of the foster mothers are first-calf heifers; they take readily to the calves and rear them just as well as the older cows do.

Dairy farmers' problems could be eased considerably if they reared calves in this way. They would also be helping in the drive for greater butter production by rearing more heifer calves to replace the increased numbers of dairy cows and heifers slaughtered over the past two years.

Failure to rear calves well on foster mothers may usually be traced to the placing of calves of different sizes on the same cow; to delay in fostering the calves after calving; to the mistake of allowing the cow's own calf to remain with its own mother; and lastly, to insufficient feeding of the foster mother.

The rearing of large numbers of heifer calves on foster mothers should not necessarily reduce butter production because, on so many farms, the amount of labour available and not the number of cows is the limiting factor. More cows can be milked with the available labour where calves are foster reared. Foster mothers can be selected from cows that it is intended to cull, although in such cases the number of calves fostered on each cow should be varied in accordance with her expected production.

Allowing for delayed culling, the new milk normally fed to young calves, the extra cows that can be milked with the labour available, and the return of the foster mothers to the milking herd after weaning the calves, it may be possible to increase the production of dairy produce by rearing large numbers of calves in this way.

Fertility in Sheep

The Council for Scientific and Industrial Research has recently published a bulletin entitled "Fertility in Sheep," by R. B. Kelley, D.V.Sc., and H. E. B. Shaw, B.V.Sc. The investigations on which the bulletin is based were commenced in 1935 and have been carried out on several types of Merino, Merino crosses and British breeds at Gilruth Plains in South-West Queensland, the McMaster Field Station near Sydney, the Cressy Experimental Farm near Launceston, Tasmania, and two properties in North Queensland.

The principal finding over this large range of climatic and geographic conditions is that ewes have annual breeding and non-breeding seasons. At all centres the breeding seasons were in late summer, autumn, and winter and not in the spring and early summer.

Generally, it was found that the breeding season commenced in January when a small percentage of ewes comes "in season," and can be bred. The percentage increases during February, and by March practically 100 per cent. of the ewes are "in season." If not bred from, the ewes continue to come "in season" at regular intervals, about seventeen days apart, during March, April, and May. The percentage coming "in season" during June, July, and August gradually decreases and then ceases suddenly during September. During October, November, and December very few, if any, ewes normally come "in season," as this appears to be the non-breeding season.

Some differences were observed between breeds, strains and individual ewes, and it was found that Merinos have relatively long breeding seasons, that Dorset Horns have a breeding season commencing as early as Merinos, and that Border Leicesters have a relatively restricted breeding season.

Ewes mated during the non-breeding season will not take the rams and, to ensure the highest percentage of lambs, it is necessary to leave the rams with the ewes until all the ewes have been "in season" which, on the results of the investigations referred to above, would not normally be until the end of March at the earliest.

Horses

The horse is taking an important part in the national effort to assist the Empire. By efficiently using all available working horses for transport and farm power purposes, great savings in the quantities of imported fuel, oil, spare parts, and machines can be made.

There have been many debates on the subject "horse versus tractor," and admittedly there is much to be said for both sides, but the efficiency of the tractor depends largely on the cost and availability of fuel, and it stops when the fuel supply is cut off.

The use of tractors has tended to increase the acreage sown to such crops as wheat while, where horses are worked a considerable portion of the cropping area is sown with oats for horse feed. This encourages crop rotation, reduces the area of the principal crop sown, makes the farm self-supporting, as there is no outward expenditure for fuel, oil, spare parts or new machines, and spreads the labour evenly throughout the year.

The extent to which horses can be used is limited by the number of horses available and immediate attempts to increase the working-horse population by breeding would not show results for four or five years. Unfortunately the horse population has been allowed to dwindle considerably in recent years, and there is a likelihood of scarcity of animals in the near future unless more horses are bred, and those on hand are properly cared for.

[W. D. Shew. G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Self-feeders reduce the labour of pig feeding.

Pigs

As pig raisers are now holding their pigs to grow to heavier weights for slaughter, there will be a tendency to over-stock pens and paddocks, and therefore some precautions will be necessary to ensure good results.

Sufficient trough space should be provided to enable each pig to get its fair share of the food.

Pigs should be graded frequently to keep those of similar size in each pen or paddock.

The fewer pigs kept in each lot, the better they will thrive.

Self-feeders simplify the keeping of large numbers of pigs, and to a degree they reduce the ill-effects of overstocking. Even pigs of different sizes do reasonably well when they are self-fed and do not have to compete at the trough, as is the case when hand-feeding at the trough twice or thrice daily is the practice.

When pigs are given two or three meals daily at the trough, about ten inches of trough length is required for each pig of bacon size, but in self-feeders the ten inches of trough space will serve three to four baconers.

The self-feeder will save considerable labour, and ensures rapid growth and fattening. However, it is not suitable for dry sows, or for fattening pigs which are of such type as to require a restricted diet.

When wheat is self-fed to pigs, the saving which results from grinding is so small that it barely warrants the cost of grinding, and where labour involved in grinding wheat is a serious problem, it may well be fed as whole grain through a self-feeder.

The waste of grain is very considerable when whole wheat is hand-fed to pigs, and therefore it should always be ground or crushed except when self-fed.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry

Care of Birds in Hot Weather

During the hot summer months special care should be given to poultry in order to avoid undue loss. There are various means of reducing mortality during a heat wave. Good results are achieved by hosing the litter, the walls of the houses, and the birds, at frequent intervals before, and during the hottest part of the day.

Houses should be well ventilated and roomy. Nests should be placed inside the houses, away from the hot sun, and have sufficient room and ventilation, so that the birds will keep as cool as possible while laying.

A continuous and easily accessible supply of fresh cool drinking water is essential. Water vessels placed temporarily on the floor and as near as possible to the birds while they are distressed will help to avoid loss.

With general good management, the birds will maintain a high standard of health and natural resistance to varying weather conditions, and this will greatly help to reduce mortality.

Marketing

Live poultry should not be forwarded to the Melbourne markets during extremely hot weather. Risk of mortality during transit will

be reduced if poultry are despatched in the cooler weather, especially when suitable rail or other accommodation is not always available, as at present.

Owing to transport difficulties and the many delays occuring in transit consignors should, if possible, forward live poultry to reach the first sale on Tuesday. If they arrive too late for this sale they will be in time for the sale on the following Thursday. After this sale it is difficult to handle consignments arriving late, and the birds usually have to be held for sale on the following Tuesday. This delay involves great loss of time and expense, not to mention the considerable deterioration that takes place in the quality of the birds.

Consignors are advised to forward birds for sale at least two or three weeks before Christmas. White Leghorn hens, particularly, are often sent in considerable numbers when the holidays are near with the object of obtaining higher prices, but usually the demand is not in proportion to the supply at this time. With transport difficulties and the shortage of labour, large numbers of birds would be difficult to handle, and, therefore, prices may not be any higher, or as high, as those ruling earlier in the month. Buyers in particular would not be able to take large supplies at the last moment, especially as more labour is required to pluck the birds.

Poultry should not be kept too long before marketing with the expectation of receiving a higher price later. Birds much older than five to five and a half months are too old to be classed as chickens or young roosters. Chickens below these ages are always in demand. Old roosters are termed stags, and realize much lower prices than chickens. The largest hens in the best condition naturally bring the best prices for birds of this class. Muscovy drakelings are at their best at approximately fourteen to sixteen weeks old, and Muscovy ducklings, from twelve to fifteen weeks old. After these ages they quickly depreciate in value. Turkeys are in best demand when not more than nine to eleven months old, but are sold in greatest numbers during the months of June, July, and August. Goslings should be in good condition at four to five months old.

Birds of inferior quality, those with crooked breasts, and with scaly legs, are not desired by the buyers.

Too many birds, especially heavy breeds, are often placed in the one crate. When this is done, especially during a long journey, or in hot weather, many are trampled to death, with great loss to the sender. Different kinds of poultry such as turkeys, geese, ducks or fowls should not be placed in the same crate, unless the crate is partitioned. Similarly, large birds should not be crated with small ones. When forwarding turkeys, ducks, or geese, some straw should be placed on the floor of the crate. When birds are to be sent over long distances, they should be given food and water immediately before despatch.

[H. F. Clinton, Poultry Expert.]

Bees

Most apiarists in Victoria have experienced a very trying time during the past few weeks, abnormal weather conditions and dearth of nectar having brought thousands of colonies of bees to the verge of starvation. Feeding with sugar syrup has been more or less general throughout the State.

In some localities small areas of summer flowering eucalypts give promise of a light yield, but these areas are too small to accommodate the large number of colonies that would have been transported to these districts under normal flowering conditions.

A pleasing exception has been the coastal ti-tree along the shores of the Mornington peninsula. Bees moved into this area are in good condition, and during October gathered and stored sufficient honey to carry them through the summer.

In South Gippsland, a light yield from white clover is expected.

The young growth on the Ironbark and Grey Box should now be far enough advanced to give an indication of the extent of bloom to be expected from these sources during the autumn. Should profuse budding be noticed, breeding should be encouraged by stimulative feeding to ensure strong colonies by February and March, the blooming period of these trees. In the meantime, apiarists residing in the irrigation areas or adjacent to fields of flowering thistle should divide the apiary into small groups of a few hives placed throughout the district, thus enlarging the field to be worked by the colonies.

[J. W. Thomlinson, Apiary Inspector.]

Septic Tanks for Dairy Farms

By E. A. HEPBURN, B.C.E., A.M.Inst.C.E.,
Sanitary Engineer, Public Health Department

THE installation of septic tank systems on dairy farms is most desirable as a means of reducing the risk of spreading typhoid and other intestinal diseases. A pan-closet can be so constructed as to be flyproof when the lid covering the seat opening is closed, but there is always the risk that it will be left open. Flies then have access to the excreta, and carry away with them a selection of the bacteria contained in it, which they may then deposit in the milk, on dairy utensils, or on food; and if the users of the closet include one who is suffering from typhoid fever, dysentery, diarrhoea, or tuberculosis or is a carrier of the first-named, these diseases may be communicated to the customers of the dairy or to other persons residing on the premises. Also there is a further risk of fly-borne infection if the pan contents are not properly buried.

A septic tank system removes this risk, as the excreta is immediately submerged in water, then flushed into the covered tank, and, if the advice given in this article is followed faithfully, neither the excreta nor any liquid extract of it is at any time accessible to flies. There remains another possible route of infection, namely by the hands of the infected person or carrier, which risk can be eliminated by personal cleanliness. To facilitate this, a wash-basin and soap should be provided in a position convenient to the closet, so that there is no excuse for anyone failing to wash his hands after using the closet and before handling any food or dairy utensils.

What is a Septic Tank?

A septic tank is a watertight chamber in which sewage is detained for a sufficient period to allow the coarser solid matters to separate from the water, floating or sinking according to their weight. The partly clarified liquid is displaced from the tank by the successive flushes of fresh sewage, while the sludge and scum are retained, and by the activity of bacteria the organic matter in them is partly converted into soluble substances, liquid, and gas. Not more than 50 per cent. of the solid matter is so converted, the remainder being changed to a material resembling humus, or leaf mould, and needing to be removed periodically.

Septic Tank Effluent

The answer to the question "Is a septic tank effluent pure?" is—emphatically, *no!* A septic tank may remove 50 per cent. of the suspended solids from sewage, but it partly replaces them by dissolved solids resulting from the breaking down of the sludge. The character of some of the dissolved solids is also changed during their stay in the tank in contact with the decomposing sludge, so that chemically a septic tank effluent is imperfectly clarified and septic sewage.

Bacterially, it is exceptional for a septic tank to reduce the number of bacteria of intestinal origin in sewage by more than 75 per cent. Some misinformed persons will say that a septic tank effluent is pure enough to drink. Actually, as regards bacteria, it is less pure than the liquid which would result from straining one pint of raw sewage through muslin and mixing it with three pints of clean water, and few people would care to drink such a mixture.

As septic tank effluent contains so many intestinal bacteria, it is a potential danger to health, and should not be exposed to the air or be allowed to contaminate any source of water supply.

Water Supply and Precautions Against Pollution

The amount of water needed for the operation of a septic tank system is about seven to ten gallons per person per day, and this amount

cannot be supplied by tanks fed from roof catchment in any ordinary case, so that another source of supply is necessary. Water which is not fit for domestic use will do to flush a W.C., and brackish groundwater may be used, but is hard on iron pipes, and if it contains sulphates, the gases from the tank are likely to be offensive, so that extra care must be taken in such cases in regard to the situation and ventilating of the tank.

Septic tank effluent must not be allowed to discharge into a stream or lake, nor into a soak-well within 300 feet of any stream or lake or well used for water supply, or within 100 feet of any underground tank. These limits do not apply to disposal of effluent by means of shallow absorption drains, but it is wise to leave a wide space between such drains and any underground tank, well, or stream, and to be sure, if well water is used for domestic or dairy use, that the effluent-disposal drains are downstream from the well, in the direction of movement of the groundwater.

Great care should also be taken that every drain carrying sewage into the tank is watertight, and if it passes close to a well or underground tank, the drainpipes should be surrounded, after jointing, with at least 3 inches of concrete.

Design of a Septic Tank System

The accompanying diagram on pages (592 and 593) shows a single-chambered septic tank suitable for dealing with sewage from one or more W.Cs. serving up to ten persons, and inset is a two-chambered tank to treat the whole of the foul drainage from the same number of persons. The impression that a septic tank will not treat anything but W.C. sewage is prevalent in the southern part of Australia, and is quite false.

Reduction in size of the single-chambered tank for less than ten people is not advised, as the Health Department's rule, derived from the examinations of over 1,100 systems, is that the capacity should be ten gallons per person *plus* 300 gallons, giving 400 gallons for ten persons, and 350 gallons for five persons. The difference is too small to justify any variation in the design.

Details and dimensions are clearly shown in the diagram, and it is only necessary to add that there is no minimum legal distance for the tank to be kept from the dwelling or the W.C., and the W.C. compartment may be in the house if air-disconnected from bed and living rooms.

Materials and Method of Construction

The materials required are:—

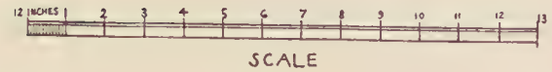
1. Water-pipe, ½-inch diameter, to supply the cistern from a water service or an elevated tank.
2. A tested flushing cistern of 2½ gallons capacity, and a tested pan with hinged seat, also a length of 4 feet or more of 1¼-inch flush-pipe, of 22 gauge galvanized sheet-iron or of water-pipe.
3. Four-inch diameter tested glazed stoneware pipe, of length to suit the particular layout, and including two 90° bends, one square junction and one oblique junction. Also 8 feet of straight 3-inch glazed stoneware pipe and two 90° bends. These may be untested.
4. Three-inch agricultural drain-pipes of length depending on the number of persons served, and the absorption capacity of the soil. An average figure will be about 16 feet per person served.
5. At least 8 feet of 4-inch galvanized iron vent pipe with cowl, and one 4-inch ashdown induct vent.

6.

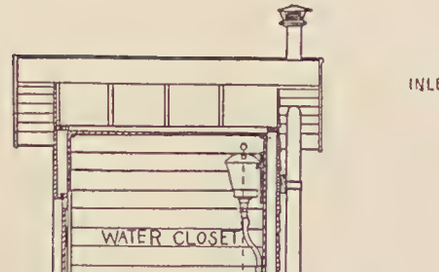
Tank Construction.	Screenings or Gravel.	Sand.	Cement.	Limil.	Bricks.
As in diagram..	⅔ cubic yards	1⅓ cubic yards	11 bags	4 bags	1,200
With 4½-in. brick walls (for firm ground)	½ „ „	1 „ „	8 „	3 „	600
With 6-in. plain concrete walls	2⅓ „ „	1½ „ „	14 „	5 „	..

[*Continued on page* 594.

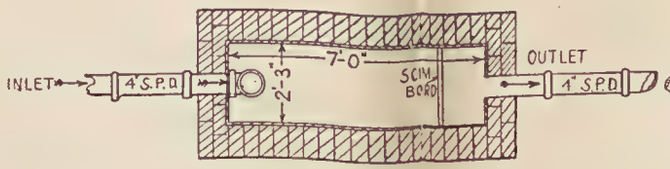
PUBLIC HEALTH DEPARTMENT
VICTORIA



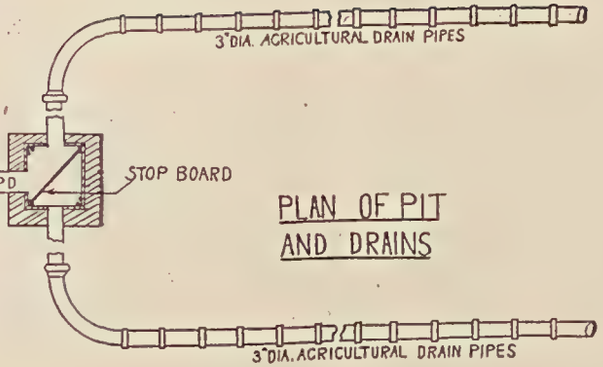
SCALE



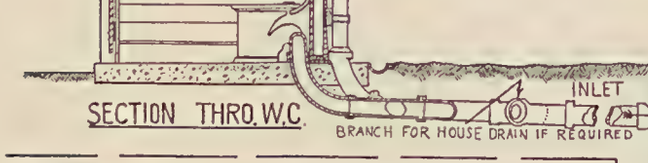
SECTION THRO. W.C.

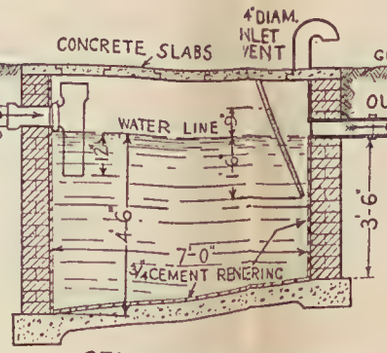


PLAN OF TANK WITH COVER REMOVED

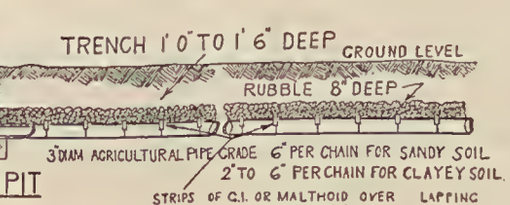


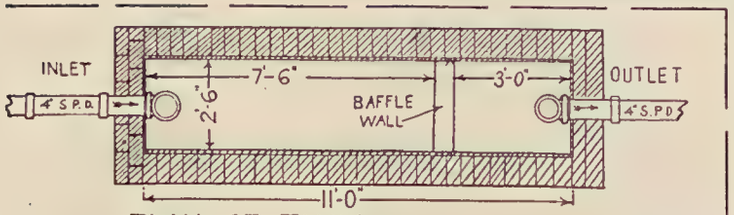
PLAN OF PIT AND DRAINS



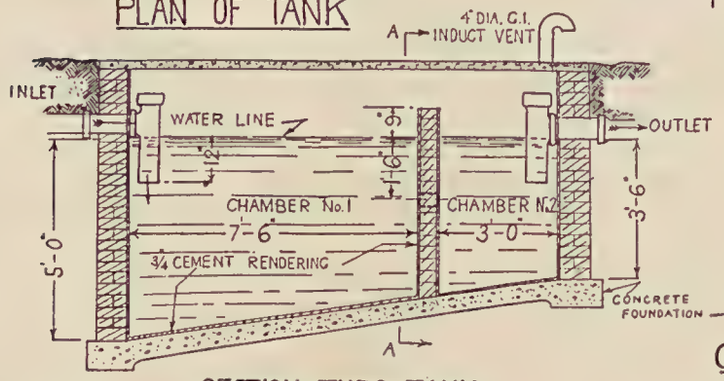


SECTION THRO. TANK

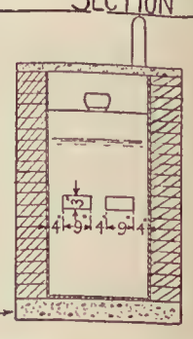

GROUND LEVEL
TRENCH 1'0" TO 1'6" DEEP
GROUND LEVEL
OUTLET
RUBBLE 8" DEEP
3" DIAM AGRICULTURAL PIPE GRADE 6" PER CHAIN FOR SANDY SOIL
2" TO 6" PER CHAIN FOR CLAYEY SOIL
STRIPS OF G.I. OR MALTHOID OVER LAPPING HALF OF PIPE JUNCTIONS.
SECTION THRO. PIT



PLAN OF TANK



SECTION THRO. TANK


CROSS SECTION "AA" THRO. TANK

SEPTIC TANK TO TREAT ALL FOUL DRAINAGE FROM A HOUSEHOLD OF UP TO 10 PERSONS.

SEPTIC TANK SYSTEM

FOR THE USE OF NOT MORE THAN 10 PERSONS FOR W.C. DRAINAGE ONLY. SUITABLE FOR FARMHOUSES OR OTHER PREMISES WITH SUFFICIENT LAND AVAILABLE FOR DISPOSAL OF EFFLUENT.

7. For scum-board, a thin reinforced concrete slab, slate slab, ½-inch fibrocement, or ¼-inch wired-glass, 28 inches square.
8. Filling around agricultural drains, of screenings, gravel. ashes, or coke, ½-cubic ft. per foot of drain.

As to the method of construction, it is advisable, if the farmer has not had experience in such work, to get a tradesman to install the pan and cistern and to lay and joint the drain thence to the tank. All the rest of the work can be done by any handy man.

The first thing is to take levels, as the absorption drains must not be more than 18 inches deep anywhere. Allowance must be made for the fall in the drains, and also for a drop of 2 to 3 inches from the inlet to the outlet of the tank, otherwise the inlet pipe is likely to block. In very flat ground it may be necessary to raise the closet floor a foot or more above the ground to get the necessary fall and keep the absorption drains at the required level, and this will necessitate protecting the inlet drain by a thick layer of concrete where it is above ground or has insufficient cover for safety.

The excavation for the tank should be made true to size if the walls are to be of concrete, otherwise material will be wasted. With brick or concrete block walls extra width is only so much extra earth to shift. The bottom should be trimmed to the correct fall, and the concrete poured 4 inches thick. This should be made of four parts gravel or screenings, two parts sand, and one part cement, placed on a mixing board, and turned twice dry and twice wet, only enough water being used to give a stiff mixture which will not flow down the slope of the excavation. If the walls are to be of brick or concrete blocks, steps 6 inches high should be formed in the concrete under the side walls to give a level bearing for the walls.

The walls can be built as soon as the floor is firm enough to stand on. Bricks or blocks should be laid in compo. mortar, of nine parts sand, two parts cement, and one part limil, with all joints filled for their full depth, the inner faces being afterwards raked out ½ inch deep to give a key for the cement rendering. The inlet and outlet pipes must be placed in position as the walls reach the correct level, and cemented in position. The inlet pipe may give some trouble, as the branch is usually too short to give a good anchorage. To overcome this, a brick "header" may be left projecting at the level of the lower end of the vertical pipe to act as a support. It must not project beyond the inner face of the pipe, otherwise it may cause blockage.

The concrete slabs for the cover are made in moulds 12 inches wide by 3 inches deep by a length depending on the thickness of the walls. Each form has a piece of 1½ x 1½ inch wood nailed in each of the side angles. Concrete of the same mix is poured into the mould to a depth of 1½ inches, and then the reinforcing rods laid on it, and the mould filled to the top. Three lengths of No. 8 gauge black fencing-wire per slab give sufficient reinforcement, and they may with advantage be connected together at three or four points by cross-wires of lighter gauge to hold them parallel. These slabs should be laid dry, i.e., without mortar, for easy removal.

The floor and walls should be rendered with ¾-inch thickness of mortar, steel trowelled to a smooth, hard and waterproof face, and with all angles rounded out.

The trenches for the drains should be taken out with their bottoms dead true to grade, and if any part is taken out too deep, it should be levelled up with sand. The pipes are laid from the lower end, and a groove must be made for each socket, so that the full length of the barrel of the pipe rests on the bottom of the trench. If you do your own pipe-laying, make up a ball of sacking which will fit closely, but not tightly in the pipe, and attach it to a length of fencing wire about 3 feet long with a loop at the other end. Place the ball in the pipe built into the tank, and slide the next pipe over the wire handle. Make a bed of stiff mortar in the lower part of the socket of the built-in pipe, and bed the next pipe on this, so that the lower internal surfaces of both pipes are in a true line, then fill the remainder of the joint with mortar, with a 45° fillet extending along the barrel from the outer edge of the socket. Pull the ball of sacking past the joint to remove any mortar which may have been squeezed into the pipe, and continue with the next pipe.

The cost will vary with the local prices of materials and on the length of drains, but on the average, with no allowance for labour costs, and with 20 feet of 4-inch drain and 100 feet of agricultural drain, the cost should be about £25 for 9-inch and £20 for 4½-inch walls.

Effluent Absorption System

The laying of the agricultural pipes needs no detailed description. The pipes are merely butted end to end, the joints covered with saddles of iron, malthoid, &c., to keep out earth, and the trench at the sides of and for 3 inches above the pipes filled with any hard material such as broken stone, gravel, or ashes, or brushwood bundles. It is advisable to cover the stone, gravel, &c., with a layer of old sacking, paper, straw or grass, to keep the earth from filling the spaces until it has time to set. The agricultural drains *must not* open to the surface of the ground. Their purpose is to allow all the tank effluent to be absorbed in the lower layers of the soil, where its purification is completed by the same soil bacteria that convert stable manure into plant food.

When the construction of the system is complete, the tank should be filled with water, and if it can be obtained, two or three buckets of "ripe" black sludge from an old tank should be poured in to seed the tank with bacteria and to render its contents slightly alkaline. If no sludge is obtainable, a handful of slaked lime can with advantage be placed in the closet pan and flushed into the tank two or three times a week for the first few weeks, to counteract smelly acid fermentation which usually develops in a new and unseeded tank. The practice advocated by some of placing a dead animal or stale meat in a new tank is quite useless and productive of foul smells.

Every septic tank requires to be cleaned sooner or later, depending on its size in relation to the number of users, and on some unknown factors. The tanks shown should in an average case operate for three years when used by ten persons and perhaps for five or six years if used by only five persons.

The usual method of cleaning small tanks is to shovel off the scum, then bale out the liquid and sludge, and to bury the whole of the contents in a shallow trench, but the local Council or its Health Inspector should be consulted before this work is done. Ten gallons or so of liquid sludge—not old gritty stuff from the very bottom of the tank—should be set aside, and returned to the tank to re-seed it after cleaning.

General Information

Before a septic tank system is installed, the approval of the local municipal council must be obtained, plans and specification being submitted and application made on a form available from the Council's offices.

Disinfectants must not be admitted to a septic tank, as they kill the liquefying bacteria, and the tank then quickly fills with sludge.

Solid refuse, rags, &c., must not be placed in the pan, as they may block the drain or the inlet to the tank, and if sanitary paper is unobtainable, newspaper should be cut to size before being placed in the closet, as large sheets of it are a frequent cause of blockage.

HARVEST HOME

Land Army girls stack-building on a Victorian farm.

Harvesting is a strenuous business and a vastly important one, especially in these days of war. The fighting forces and civilians must be fed, and the Australian farmer in helping to feed them gives token of the vital position he occupies in the Nation's wartime economy.

Superphosphate Rations for 1943-44

THE Victorian Department of Agriculture has received from the Commonwealth Government the final allocation of superphosphate to Victoria for 1943-44 and particulars of the rationing plan for that year were announced recently by the Director of Agriculture, Mr. H. A. Mullett.

For the year 1st July, 1943 to June, 1944, the following rations of superphosphate will be allotted.

(*a*) **Priority Crops** (including Vegetables, Potatoes, Flax, Blue Peas, Navy Beans) will be allotted a ration of superphosphate adequate for proper manuring of these crops. The ration in each case is determined by the Department of Agriculture in accordance with the known requirements in each particular district. Applications should be made to the Fertilizer Section, Department of Agriculture, 81 Collins-street, Melbourne.

(*b*) **Pastures.** Pastures upon which dairying is conducted and which have previously been top-dressed with superphosphate, and all approved irrigated pastures will be allotted a supplementary ration in addition to the ordinary ration. The supplementary ration will be 25 per cent. greater than that received last season, subject to review in special cases.

Some farmers have already received an advance on their No. 2 supplementary ration to meet their requirements for spring usage and any balance due can now be procured. Consumers must order their rations from the firms or distributors who supplied them last season.

Hay production has declined seriously in recent years and to increase the output of oaten and shandy hay in the nearer metropolitan areas, particularly for use on farms producing whole milk, a supplementary ration will be granted to bona fide hay growers who supply these requirements.

(*c*) The ordinary ration for all crops and pastures for 1943-44 will be 75 per cent. of that received last year. This is the equivalent of one-quarter of the annual quantity purchased for the property in the years immediately prior to rationing. The ordinary ration of growers of priority crops and those who received a permit for fertilizer since 1st July, 1942, will be assessed by the Department of Agriculture and manufacturers, agents, butter factories and other distributors must not supply the ration in such cases until the assessment has been made by the Department. Any consumer who considers the ration for his farm is below one-quarter of the past normal usage of superphosphate may, as previously, apply to the Department of Agriculture for an adjustment of his quota. On the other hand, cases where the quota is more than one quarter of normal will be reduced to the standard amount.

Where a property is sold or leased, the new occupier should take the necessary steps for the superphosphate ration for the property to be transferred to him, as, under the Rationing Plan "the ration goes with the land". Any farmer who experiences difficulties in obtaining his appropriate rations should report the case fully and immediately to the Department of Agriculture.

The distribution of the superphosphate this season has been seriously affected by the tranport and labour position and farmers are urged, in their own interests, to order their rations immediately from their supplier of last season, and take delivery at the first opportunity in order that the limited transport available can be used to the best advantage.

IN THE ORCHARD

Contributed by Officers of the Horticultural Division

Left: Healthy citrus trees irrigated by flooding. Right: Faulty irrigation causes salt injury.

Irrigation

THE main factor in determining the health and longevity of a plantation of fruit trees is the state of health of their root systems. In the irrigation areas fruit growers are able, to a large degree, to control the moisture content of the soil in the root zone. To this extent they are responsible for the healthy condition of their trees. Wrongful use of irrigation water will produce conditions unfavourable to root growth, with the result that the health of the trees will be adversely affected. Excess water, for instance, is likely to cause decay through lack of air and by making conditions favourable for root rotting fungi.

In certain soils, uneven watering may result because water penetration is rapid near the head ditch; the trees at the end of the run receiving insufficient water. This condition can be remedied by reducing the length of run. On light soils in the Murray Valley, this should not exceed 3 to 4 chains. Another example of overwatering a section of orchard or vineyard may occur where the boundary of the two soil types crosses the irrigation run. For instance, a sandy loam and a clay loam may be watered by the same set of furrows, in which case the lighter soil will be overwatered in order to provide sufficient for trees or vines on the heavy soil where penetration is slow. Here the layout of the irrigation channels would need to be altered in order to provide different systems for both soil types.

Overwatering without the provision of adequate drainage is likely to raise the level of the underground water to such an extent that waterlogging occurs, as previously mentioned. If salt is present in the subsoil, this will be brought up to the root zone by diffusion. The installation of drainage schemes in parts of the Murray Valley areas have largely prevented this trouble, but by care in the method of application of water, the possibility of damage can be reduced.

Watering by sprinklers is definitely the safest method on most soil types, but cost and difficulty in securing the necessary equipment will make such installations a post-war project. Next best methods are flood or multi-furrow irrigations, whereby a more even penetration throughout the soil is obtained than by using two or three furrows.

Because the penetration of water through soils varies according to the type, a knowledge of the moisture content in the root zone will be a valuable guide to growers concerning time and amount of water to apply on the various soils in their property. This information may be obtained by sampling with a soil auger. Also the installation of test wells made by sinking holes 3 to 4 inches wide and 6 to 8 feet deep, and inserting perforated downpiping will give a ready means of determining any rise in the level of free water in the soil.

Spraying

Apples and pears will require further sprays of lead arsenate this month. It is advisable to take careful note of moth activity as indicated by lure catches in the district so that the sprays will be applied at the best possible time. If red spider or woolly aphis is on the move, combine the lead arsenate with white oil emulsion, 1 gallon in 80. On some orchards, woolly aphis appeared to be multiplying rapidly in the spring and growers were rather concerned, thinking that the parasite wasp used to control this pest may have disappeared. This frequently occurs when the spring is comparatively cool. When the weather warms up, however, the parasite becomes increasingly active until it eventually controls the aphis.

If any sign of brown spot infection appears on passion fruit, a spray of Bordeaux mixture, strength, 6:4:80, should be applied and any infected shoots should be removed.

Because of favourable weather conditions, aphis has been severe on peaches and various other fruit trees. Nicotine sulphate has been in very short supply and consequently the aphis has gone unchecked in many orchards. Some control may be effected by using kerosene emulsion, a spray which may be prepared quite easily by the following method:—

Dissolve a half a pound of soft soap in 1 gallon of water and bring almost to the boiling point. Remove the soap solution from the source of heat and, stirring rapidly or using a hand spray pump to keep the solution in motion, add slowly 2 gallons of kerosene. This mixture will make up 45 gallons of spray.

Prevention of Fruit Drop

Growers of Williams' pears have welcomed the spray which has been successfully used to prevent the pre-harvest drop, a cause of severe loss in some years. The chemical, a synthetic plant hormone, is available in tablet form, one tablet being sufficient for 100 gallons of spray. The spray should be applied eight to ten days before the anticipated date of picking and the effect should last for about twelve days following application. Spraying should be thorough and directed particularly at the stalks of the fruit. The chemical can be combined with arsenate of lead or white oil application, should such a spray be required. The tablets cost 17s. each and are available in packets of ten. Growers desiring further information on this spray should write to the Department of Agriculture, Treasury Gardens, Melbourne, C.2.

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal, School of Horticulture, Burnley Gardens.

THE summer flowering annuals will now be growing strongly, and as most of them have a fairly shallow root system, cultivation between the plants should be limited to about 1 inch. When the plants become too crowded to allow of cultivation, a mulch should be applied. This will retain moisture in the surface soil and keep it cool. This mulch can take the form of lawn clippings, well decayed manure, or humus from the compost heap. Tall growing marigolds and zinnias, &c., may require light staking. In order to make the plants bushy, the first flowers arising from the main stem should be cut off. This will encourage lateral branching and produce a better effect a little later.

Winter Flowers

Some of the hardy summer flowering annuals, such as marigolds and salvias, if planted in a warm, sheltered position, will continue to flower well until winter. For the bulk of the winter flowers, however, preparation of the seed beds and sowing of the seeds must commence now.

The seedlings must be planted out during January and February to benefit from the warm autumn weather. Where the soil is heavy, sowing of seed should commence in December, but in the lighter soil districts, January sowings will be satisfactory. Plants which are useful for providing winter flowers are Antirrhinums and Iceland Poppies.

Antirrhinums

Antirrhinums like a well-drained soil and a fairly liberal application of lime, from ½ lb. to 1 lb. per square yard. They do well in a fairly dry, sunny position, and water should be applied to them with caution; many gardeners overwater this plant with disappointing results. There is a large range of flowers, from the tall, large-flowered types to the extra dwarf plants which grow only 9 inches high. The tall ones lend themselves well to background plantings against fences or shrubs, and they are suitable for cutting; the very dwarf types are used chiefly for bedding effects and low edgings. The tall large-flowered types may be obtained in mixed or separate colours—*Rose King* is a rich rose colour; *The Rose* is also a rose colour with a golden centre; while *Ruby* is a bright carmine rose. In the orange shades *Old Gold, Golden Queen and Wallflower* are very good varieties. In the brilliant crimson and scarlet shades *Cardinal,* a rich scarlet; *Monarch,* a glowing crimson, are pleasing colours, while *Purple King,* which is a dark purple, and *Yellow King* are also worthy of a place in the garden. Two good white varieties are *Snowflakes* and *Queen Victoria.* In the semi-dwarf class the following varieties are available—*Fire Dragon,* rose and crimson; *Golden Dawn,* a rich tango; *Red Chief,* deep scarlet; *Rose Beauty,* a very good pink; *Sunset,* a terra-cotta shade with salmon. The very dwarf types can be bought as a mixture containing various colours. They are usually called *Tom Thumb* antirrhinums.

Iceland Poppies

The Iceland poppy is another plant which enjoys a well-drained soil to which an application of lime has been made. To have Iceland poppy flowers in winter, it is necessary to transplant no later than February. The plants then become established during the autumn and will commence flowering in the late autumn and throughout the winter. Seed may be sown in December and early January in seed boxes or seed beds if covered with a light shade, such as hessian or thin, leafy prunings. There is a large range of varieties of Iceland poppies available, and pink and art shades as well as orange, yellow and white can be obtained. After sowing the seed, it should be lightly covered with a sandy soil and the surface kept moist until the seed has germinated.

Irises

After bearded irises have finished flowering, the clumps may be divided and replanted. When dividing, discard the old part of the fleshy stem, called the rhizome, and replant the younger portions just on the surface. The iris rhizome should not be set too deeply in the soil. Before planting in their new positions, an application of lime should be made. Do not apply humus and stable manure to the soil just prior to planting. The iris likes a sunny position, although it will grow reasonably well under very light shade. If the soil is poorly drained, the beds should be raised about 6 inches above the paths.

Heuchera

Heuchera is another plant which can be divided as soon as flowering is finished. Divide the clumps which have become too large or have been three or more years in their present position, and replant along another border. This planting will produce flowers in the following spring.

THE VEGETABLE GARDEN

Onions

As the onion matures the tops may be bent over to hasten the formation of bulbs. If the plants are showing a tendency to go to seed, and the tops are bent over by hand, fairly large bulbs can still be obtained. Do not attempt to bend over the tops of very small plants, otherwise bulb formation will be premature and only small onions will result. Onions which are mature should not be watered, but allowed to harden off. Late varieties should still be regularly watered and cultivated. Remember that shallow cultivation is necessary for onions because of the surface rooting habit of these plants. Onions which have matured should be forked and left to lie on the surface of the soil for a day or two. They can then be placed in string bags or open boxes, or tied in bundles and hung up in an airy shed to thoroughly dry. Do not attempt to store the early white-skinned varieties, because they will not keep for very long. The late, brown-skinned varieties of onions are better for keeping.

Seed Sowing

Seed of the following kinds of vegetables can now be sown in the seed beds—

Cauliflower.—Towards the end of the month sow *Greenleaf* and *Phenomenal;* these will be ready for transplanting in February.

Brussels Sprouts.—Seed of *Fillbasket* and *Covent Garden* may be sown during the month, and the plants should be ready for transplanting in February. Sow the seed thinly so that good stocky plants are obtained. A seed every 1 or 1½ inches usually gives a good sturdy plant. Do not overwater.

The following seed may be sown directly into the garden beds—

Silver Beet.—Varieties of *Fordhook Giant, Lucullus,* and *Dark Green Broad Ribbed.* Usually a single row of this vegetable is sufficient in the home garden. Sow a few seeds at intervals of a foot along the row, and then thin out one plant at each of these spacings. Cover the seed with ¾-in. of fine sandy soil.

Lettuce.—Seed can be sown in a drill. Space drills 12 to 15 inches apart and thin out the plants to about 10 inches, or scatter a few seeds at intervals of 10 inches along each row and cover with ½-inch of sandy soil. At this time of the year more success will be obtained if the seed is sown where it is to remain than by attempting to transplant the young plants. *Imperial* 847 and *Iceberg* are good varieties to be sown at this time.

Beans.—*Brown Beauty* variety can be planted. Space the rows at least 18 to 24 inches apart and 4 or 5 inches between beans. Do not place the seed too near the surface. Allow at least 1½ inches of soil to cover it. If the planting is too shallow, faulty germination may result.

Carrots.—Varieties *Chantenay, Danver's Half Long* and *Manchester Table* can be sown in drills spaced about 10 to 12 inches apart. Sow the seed thinly along the drill, gently press it into the soil and cover with ½-inch fine sandy soil. As soon as the plants are large enough, thin out to about 3 inches apart.

Parsnip.—*Hollow Crown* variety can be planted in a similar way to carrots, but allow 12 to 15 inches between the rows and about 4 to 5 inches between the plants at thinning time.

Meat Meal for Pigs and Poultry

THE manufacture of meat meal has increased during the last few weeks and sufficient supplies are now available for inclusion in the rations of poultry and pigs. This announcement was made recently by the Director of Agriculture, Mr. H. A. Mullett.

The sale of meat meal in Victoria is controlled by the Department of Agriculture, and every effort is being made to ensure that producers obtain their urgent requirements. Many producers use meat meal mixed with grain, pollard, &c., to produce a balanced ration for their stock, and it is important that they should continue to do so in order that production may be economically increased.

Users who are short of meat meal should apply again immediately to their regular supplier or suppliers for their urgent requirements. If the order cannot be met in a reasonable time, application should be made to the Department of Agriculture, Melbourne, for information as to a source of supply. It may not be possible for users to obtain the brand of meat meal they used previously but for the guidance of users, the guaranteed protein content of the meal available will be shown on the label affixed to each bag. All applications must include the name of the usual supplier, the agent or merchant concerned, the brand of meat meal usually obtained, and the purpose for which it is required, whether for pigs or poultry.

Where one ton of meat meal will be required during the next few months, that quantity should be ordered to simplify problems of transport and manpower.

Do Your Own FRUIT BOTTLING

An Inexpensive Method

By RACHEL M. PEILE, Fruit Preserving Expert

OUR grandmothers would never allow a year to pass without lining their pantry shelves with the fruits of summer and autumn. Of late years, however, the ease with which canned preserves have been available to the present generation has made fruit bottling one of the half-forgotten domestic arts.

The recent shortage of canned fruits, however, has brought about a revival of interest in fruit preservation, many housewives discovering for the first time the virtues of this ancient art.

Now that the fruit season is again upon us those housewives who did their own bottling in previous seasons will be making provision for the months when fresh fruit is not readily available; they will not need the instruction given in the following article, which is written for the information of those who have not yet done any fruit bottling.

Equipment Required

Fruit should be fresh, free from blemishes and of firm texture, but not under-ripe.

It is quite unnecessary to buy expensive equipment. A satisfactory sterilizer can be made by using a washing copper, clothes boiler, or kerosene tin. Preserving jars are perhaps the most expensive item, but any jar which can be made airtight will be suitable, while any type of stove may be used. The most easily obtained jar at the present time is the "Utility" type with screw top and metal insert, which takes the place of a rubber band. These jars can be bought at most large hardware stores at reasonable prices. When opening this jar after storage, the lids should be unscrewed, the jars inverted and the tops placed in hot water for a few minutes, then with a sharp-pointed knife, the seals may be gently prized off. If the inserts are given careful treatment, they may be used a second and third time, provided the grey or red rubber band inside the rim is not displaced.

Rubber rings used in other types of bottle should be sterilized. Any danger of black rings tainting bottled fruit or tomatoes may be removed by boiling them for 5 to 10 minutes in a little of the brine or syrup to be used in bottling. The rings should then be rinsed, well dried and left exposed to the air for at least three days.

Pickle bottles with well-fitting corks make excellent containers for small fruits. To seal the bottles after sterilization, the sterilized corks should be pushed well in, the bottles inverted and the tops dipped into melted candle or paraffin wax.

An effective war-time seal for any glass jar when lids or rubbers are not procurable, may be made by melting 8 oz. of resin, 1 oz. paraffin or candle wax and 1 oz. vaseline together. A circle of old white cloth, 1½ inches larger than the top of the jar and a piece of thick white paper to fit exactly the top of the jar, should be cut out. A layer of the mixture should be painted over the centre of the cloth and the paper pressed firmly on to it. When the fruit is sterilized, the seal should be placed over the top of the jar (make sure that the paper exactly fits the top), pressed firmly down and the seal tied with string.

Method No. 1

Make a syrup by boiling together 4 oz. sugar and 1 pint of water for fruits other than gooseberries, which will take 5 oz., strawberries, figs, and oranges which require 12 oz. sugar, to the pint. Strain the syrup and allow to become cold. Prepare the fruit by washing and peeling. Pack firmly into the jars and add the syrup. For peeled fruits, fill the jars with cold syrup; for unpeeled fruits add 1 tablespoon of syrup only; soft berry fruits require no syrup.

When preparing peeled fruits, they should be dropped into slightly salted water (1 dessertspoon salt to 1 quart water) to prevent them from discolouring. Place the lids loosely on the top of each jar, then stand the jars on a platform in the sterilizer. The stand should be about 4 to 5 inches high, with cold water reaching just below the level of the stand. Place a lid on the sterilizer, then bring the

water to the boil and keep it boiling until the fruit is tender. This may be ascertained by testing the fruit with a sterilized knitting needle or fork. When tender, remove the jars one by one on to a damp cloth, then fill up and overflow the jars with boiling syrup and seal immediately.

When there is a shortage of sugar, the fruit may be preserved in plain water. It will keep equally well. When cool, the seals should be tested and the jars stored in a cool dark place.

Utensils suitable for fruit bottling.

Method No. 2

Fruit may be bottled successfully without the use of a sterilizer. By this method a preserving pan and jars are the only equipment required. Although the appearance of the fruit is not so attractive, a larger amount may be placed in each jar. Make a syrup in the preserving pan, using 4 to 6 oz. sugar to 1 pint water. Add the prepared fruit and boil all together gently until the fruit is tender. Care should be taken to keep the fruit as whole as possible. Then place it *at boiling temperature* into hot sterilized jars and seal immediately.

To sterilize the jars, either place them in a cool oven for half an hour, gradually raising the temperature until the oven is hot, or place them in a boiler in 2 inches of water with all other utensils used. Allow the water to boil and keep it boiling for 10 minutes.

Pulping

Pulping is an economical method used for preserving apples, quinces, pears, apricots, peaches, tomatoes, and soft berry fruits.

Prepare the fruit as for cooking, place in a saucepan with just sufficient water to prevent burning, and cook until tender. Have ready such containers as preserving jars, treacle or powdered milk tins with press-in lids. These should be sterilized by placing in an oven, or by heating in boiling water with all the other utensils used. The boiling pulp is poured immediately into the hot jars, which should be placed on a damp cloth. The jars are then sealed immediately. If preferred, sugar or other flavouring, such as salt, ginger, or cinnamon may be added.

Tubercle-free Herds

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hospital	Ballarat	66	McNabb and Son, G. A.	Irrewillipe East	154
Ballarat Orphanage	Ballarat	135	Nancarrow Bros.	Kerang	52
Banyule Stud Pty. Ltd.	Wangaratta	31	Northcote Children's Farm	Bacchus Marsh	156
Black, I. S., Estate	Mount Noorat	53	Onley, W. H.	"Glenholme," Caldermeade	67
Clarke, A. B.	Glenormiston South	15	Parker, Mrs. L. M.	Tallarook	56
Dennis, Mrs. A. A.	Frankston	42	Payne, A. E. T.	"Yarra View," Lilydale	63
Dookie Agricultural College	Dookie	85	Payne, T. E. N.	"Woodburn," Kilmore	46
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	18	Poole, M. A. and D.	Caldermeade	134
Geelong Grammar School	Corio	68	Poole, M. A. and D.	Yannathan	72
Gibson, Mrs. C. S.	"Sweeney's," Eltham	35	Powell, T. S.	"Carellen," Mansfield	46
Gorman, A. W.	"Cathcart," Alexandra	57	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Henry, J. A.	Warrnambool	41	Samuel, Misses G. and E.	Lang Lang	48
Holloway, R. W.	Caldermeade	75	School of Horticulture	Burnley	10
Kilmany Park Farm Home for Boys	Sale	104	State Experiment Farm	Rutherglen	40
Lawrence, P. H.	"Rainga," Tarrawarra	72	State Research Farm	Werribee	229
Longerenong Agricultural College	Dooen	43	Tanner, N. J.	Pakenham	33
			Vagg, T. E.	Officedale	45
			Wells, W. G.	Caldermeade	63

In addition to the above-mentioned herds there are 298 commercial dairy herds containing 10,691 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 753 herds in which 14,692 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tubercle-free herds.

Veterinary Scholarships

The Government has decided to award four Scholarships to enable selected Victorian students to undertake the course in Veterinary Science at the Melbourne and Sydney Universities. The Scholarships will be tenable for five years, the first of which will be spent at the Melbourne University and the remaining four at the Veterinary School of the Sydney University. Fees for the first year of the course at Melbourne will be paid by the Government, and for the remaining four years, in addition to the Sydney University fees, the Scholarship holder will receive a living allowance of £100 per annum.

The Scholarships are available only to males under the age of twenty-five, and who are qualified by matriculation to proceed to the degree to Bachelor of Veterinary Science, Melbourne University. The selected applicants will be required to enter into an agreement that, subsequent to graduation, they will be willing to accept a position in the Department of Agriculture, or practise as Veterinary Surgeons in Victoria for a period of three years.

Applications setting out full name, address, age, scholastic attainments, and other relevant information should be made to the Director of Agriculture, Melbourne, C.2.

The closing date for the receipt of applications is 22nd January, 1944.

[Inserted by the Live Stock Division.]

Standard Herd Records

For Quarter ended 30th September, 1943

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 569, of which 380 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving)	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving)	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving)	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving)	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving)	330 lb. butter-fat.
Mature cow (5 years and over)	350 lb. butter-fat.

N.C.K. denotes no chart kept.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Andrew, W., Whittlesea, Ayrshire (2).										
Kelvin Grove Fairy Morn ..	32639	273	4	7,662	4·01	307·1	290	Sr. 3	270, 254 ..	Kelvin Grove Lotus Lad 2nd
Scotswood Missie 2nd ..	30914	273	15	8,075	4·06	328·0	350	Mature	228 ..	Scotswood Pearler
Atkinson, W. K., Swan Hill, Dairy Shorthorn (25).										
Willow Park Blush 10th ..	1641D	273	16	13,233	3·67	485·6	350	Mature	353, 364, 409	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Blush 12th ..	1642D	273	24	10,739	3·90	418·4	310	Jr. 4	378, 328 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camellia 18th	524D	273	40	13,686	3·72	509·5	350	Mature	332, 423, 456, 470	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camellia 31st	1650D	273	7½	8,799	4·18	367·7	310	Jr. 4	364, 268 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 14th ..	528D	273	18	9,443	3·98	376·2	350	Mature	290, 381, 384, 423, 436, 413	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 17th ..	531D	273	11	10,986	4·05	444·8	350	Mature	273, 320, 325, 315	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 30th ..	C.C.	273	14½	6,903	3·70	255·3	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Comet 31st ..	C.C.	273	27	9,074	3·38	306·8	230	Jr. 2	.. ..	Willow Park Barrington 77th
Willow Park Countess 10th	1245E	273	12	8,192	3·30	270·7	350	Mature	371, 415, 405, 451, 524, 429, 553, 483	Willow Park Reflector
Willow Park Countess 32nd	1663D	210	4	6,255	3·83	239·6	330	Sr. 4	314, 270 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Crocus 2nd ..	2043E	273	20½	7,755	3·38	262·0	270	Jr. 3	267 ..	Willow Park Barrington 51st
Willow Park Dainty 14th	1667D	273	6	11,778	3·93	462·7	350	Mature	301, 313, 409, 411	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Dainty 18th	1519C	210 (Sold)	..	7,275	3·55	258·4	270	Jr. 3	289 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 28th	543D	273	14	8,934	3·71	331·2	350	Mature	239, 302, 396, 387, 446, 317	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 33rd	1670D	273	26	12,462	4·10	511·0	350	Mature	335, 365, 435, 428	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 10th ..	550D	273	21½	12,060	3·52	425·0	350	Mature	269, 325, 352, 392, 404	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 12th ..	1530C	273	32	12,048	3·04	365·7	350	Mature	354, 425, 335	Anderson Imperial Cran 6th (Imp.)
Willow Park Melba 25th ..	554D	273	26	11,057	3·91	432·7	350	Mature	282, 377, 508, 408	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 26th ..	555D	273	11½	7,235	3·37	243·7	350	Mature	311, 337, 318	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 27th ..	556D	273	30	10,412	4·04	420·3	350	Mature	301, 376, 394, 418	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 43rd ..	C.C.	273	20½	7,478	3·68	275·4	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 17th	1692D	273	14½	9,239	3·63	335·4	310	Jr. 4	333, 306 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 18th	1693D	273	12	10,565	3·61	381·9	310	Jr. 4	318, 276 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 21st	2049E	273	12½	8,931	3·36	299·7	290	Sr. 3	346 ..	Willow Park Imperial Cran 3rd
Willow Park Red Rose 2nd	C.C.	273	25	8,490	2·77	235·3	230	Jr. 2	.. ..	Willow Park Barrington 77th

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Ballarat Orphanage, Ballarat, Jersey (16).										
Gowanlea Oxford's Gipsy	37788	273	10	7,032	4·61	324·3	350	Mature	324, 387, 488, 415, 367, 362	Oxford Beau's Pretty Oxford (Imp.)
Merunda Delight	49537	273	12	6,351	4·93	313·4	350	Mature	433, 290 ..	Murona Airmine
Murona Silvermine 3rd	77928	253	4	4,356	5·04	219·6	330	Sr. 4	.. ..	Rowallan Celebrity
Orphanage Attraction 8th	54571	273	17	4,988	4·74	236·2	350	Mature	333, 331, 394, 438, 354, 484	Jerseylea Quality Boy
Orphanage Attraction 18th	83287	273	16	6,138	5·21	319·9	270	Jr. 3	308 ..	Banyule Terraplane
Orphanage Attraction 19th	Vol. 30	273	17	6,129	3·97	243·1	230	Jr. 2	.. ..	Orphanage Centorus
Orphanage Lotus	68460	273	12	5,248	4·78	250·9	350	Mature	283, 409, 462	Orphanage Mabel's Chief
Orphanage Melba 14th	68461	273	20	6,983	4·92	343·3	350	Mature	433, 444, 465	Banyule Terraplane
Orphanage Mirthmaker 9th	78256	248	4	3,792	5·52	209·5	350	Mature	635,570 ..	Rowallan Celebrity
Orphanage Molly 4th	58822	273	15	7,155	5·26	376·3	350	Mature	358, 265, 292, 470, 391, 547	Jerseylea Quality Boy
Orphanage Molly 17th	C.R.	273	5	3,262	6·11	199·2	230	Jr. 2	.. ..	Orphanage Attraction Knight
Rylands Fashionette	83822	273	13	5,274	5·23	275·8	350	Mature	326, 293 ..	Banaview Master
Tobermory Dulcie	74204	120	4	3,015	5·55	167·4	270	Jr. 3	405 ..	Orphanage Attractive Celebrity
Tobermory Mary	79227	273	12	4,928	5·68	279·8	270	Jr. 3	326 ..	Samares' Golden Prince (Imp.)
Tobermory Purple's Gipsey	79238	273	11½	4,880	5·56	271·5	270	Jr. 3	336 ..	Banyule Double Purple
Uphaven Silver Dawn	79350	273	16	7,355	4·99	366·8	290	Sr. 3	313, 393 ..	Banyule Terraplane
Bennett, J. W., Yinnar, Jersey (16).										
Ellendale Bluebell 9th	66334	273	N.C.K.	8,026	5·92	475·2	350	Mature	442, 420 ..	Staghorn Bellboy
Ellendale Bluebell 23rd	Vol. 30	273	N.C.K.	7,379	5·12	377·8	230	Jr. 2	.. ..	Staghorn Bellboy
Ellendale Cloudy 8th	C.R.	273	N.C.K.	7,505	5·45	408·8	250	Sr. 2	.. ..	Avalon Prince Madeira
Ellendale Duchess	47972	273	N.C.K.	7,872	4·50	354·2	350	Mature	391, 447, 424	Glen Iris Master Clement
Ellendale Duchess 5th	76081	273	N.C.K.	7,403	5·87	434·6	330	Sr. 4	458, 492 ..	Avalon Prince Madeira
Ellendale Duchess 6th	76082	273	N.C.K.	8,235	4·87	401·3	310	Jr. 4	427, 398 ..	Staghorn Bellboy
Ellendale Duchess 7th	76083	273	N.C.K.	6,255	4·53	283·3	310	Jr. 4	305 ..	Avalon Prince Madeira
Ellendale Kirsty 23rd	71154	273	N.C.K.	10,212	5·06	516·4	350	Mature	356 ..	Staghorn Bellboy
Ellendale Kirsty 42nd	81167	273	N.C.K.	7,278	5·70	414·9	270	Jr. 3	351 ..	Ellendale Banksia 5th's Bellboy
Ellendale Kirsty 44th	C.R.	273	N.C.K.	5,224	5·53	289·0	250	Sr. 2	.. ..	Avalon Prince Madeira
Ellendale Kirsty 49th	Vol. 30	273	N.C.K.	6,716	4·82	323·9	230	Jr. 2	.. ..	Avalon Prince Madeira
Ellendale Romany 11th	76089	273	N.C.K.	6,946	5·40	374·8	350	Mature	426, 420 ..	Avalon Prince Madeira
Ellendaly Romany 13th	76090	273	N.C.K.	7,986	5·78	461·9	350	Mature	467, 463 ..	Avalon Prince Madeira
Ellendale Romany 20th	C.R.	273	N.C.K.	7,128	5·03	358·3	230	Jr. 2	.. ..	Ellendale Banksia 2nd's Bellboy
Ellendale Utopia	76094	273	N.C.K.	6,448	4·94	318·5	310	Jr. 4	386, 385 ..	Clarendon Eyre Oxford Ovserver
Ellendale Waverley Lass 2nd	C.R.	273	N.C.K.	5,803	5·56	322·8	250	Sr. 2	.. ..	Staghorn Bellboy
Bennett, R. H., Lancefield, Jersey (2).										
Edenhope Dawn	81127	273	9	5,337	5·41	288·5	250	Sr. 2	243 ..	Jindivick Defiance
Edenhope Necklace	71113	273	9	7,455	4·56	339·7	330	Sr. 4	229, 345, 312	Lancefield Madeira's Chance
Black, Estate of the late I. S., Noorat, Ayrshire (3).										
Killock Juniper (Imp.)	80966	273	14	6,072	4·08	247·8	350	Mature	370, 371, 396	Burton Signet
Mount Noorat Alert 7th	31638	273	10	7,485	4·30	322·2	350	Mature	321, 386 ..	Gowrie Park Scottish Major
Mount Noorat Georgina 10th	34881	273	13	5,391	4·18	225·4	230	Jr. 2	.. ..	Gowrie Park Bonnie Standard
Bott, J., Yarrawonga, Red Poll (9).										
Blackwood Mimic	Vol. 12	273	N.C.K.	7,455	3·84	286·5	230	Jr. 2	.. ..	Blackwood Mars
Blackwood Kathryn	Vol. 12	273	N.C.K.	7,047	4·97	350·4	230	Jr. 2	.. ..	Burnwood Master
Bundure Jewel	5308AA	150	4	4,905	4·03	197·6	350	Mature	.. ..	Bundure Magnate
Lornshill Holly	6527AA	273	N.C.K.	7,613	3·99	303·9	350	Mature	293 ..	Woodburn Wiseman
Naranghi Connie	Vol. 12	273	N.C.K.	5,178	4·30	222·9	230	Jr. 2	.. ..	Bundure Monture
Naranghi Dido	6947A	273	6	9,035	3·65	331·6	350	Mature	424 ..	Bundure Winter
Naranghi Jinny	7909A	273	N.C.K.	8,322	3·82	317·9	350	Mature	255 ..	Bundure Winter
Naranghi Peace	Vol. 12	273	N.C.K.	10,507	3·42	359·3	290	Sr. 3	266 ..	Flowing Vale Purrtime
Naranghi Tecoma	Vol. 12	273	13	5,349	4·11	219·8	230	Jr. 2	.. ..	Bundure Winter
Broad, Mrs. A. A., Sutton Grange, Jersey (6).										
Grangelea Bella	81593	273	18½	5,646	5·27	297·3	230	Jr. 2	.. ..	Navua Wonderful Count
Grangelea Damsel 6th	66753	273	13	5,683	6·37	362·2	350	Mature	326, 366, 370	Grangelea Roderick 2nd
Grangelea Petal	81596	273	8½	4,803	5·56	267·2	230	Jr. 2	.. ..	Banyule Macon
Grangelea Remembrance	76591	273	9	4,962	6·27	310·9	270	Jr. 3	272 ..	Grangelea Daffodil's Aire
Grangelea Rosetta	81598	273	15	4,703	5·80	272·9	230	Jr. 2	.. ..	Navua Wonderful Count
Grangelea Vida	76594	273	22½	7,181	5·45	391·5	270	Jr. 3	296 ..	Banyule Upcast
Broad, A. J. Pyramid, Jersey (1).										
Grangelea Rose Petal	48526	273	N.C.K.	6,098	5·19	316·4	350	Mature	436, 336 ..	Clarendon Eyre Eminent's Ruddigore 3rd
Bruhn, C. H., Mirboo North, Jersey (1).										
Silverbrae Queen 3rd	69089	273	N.C.K.	5,288	5·93	313·6	350	Mature	392 ..	Silverbrae King

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Butcher, F. T., Swan Hill, Red Poll (10).										
Maryville Bella	Vol. 12	273	9	6,953	4·22	293·5	230	Jr. 2	.. ..	Victoria Generator B
Maryville Dainty ..	7860A	273	14	7,328	4·87	357·2	270	Jr. 3	272 ..	Victoria Generator B
Maryville Elma	Vol. 12	273	12	5,445	4·27	233·0	230	Jr. 2	.. ..	Victoria Generator B
Maryville Elva	3722A	273	21	8,068	4·01	323·4	350	Mature	304, 402, 356, 400, 239, 437, 419	Victoria King Bird
Maryville Etna	Vol. 12	273	13½	7,218	4·79	345·4	230	Jr. 2	.. ..	Victoria Generator B
Maryville Fancy	7863A	273	21	7,330	3·89	284·9	250	Sr. 2	226 ..	Victoria Generator B
Maryville Mermaid ..	Vol. 12	273	20	6,195	4·15	257·1	230	Jr. 2	.. ..	Victoria Generator B
Maryville Model	6911A	273	15	8,640	4·26	368·1	350	Mature	256, 375, 394	Temperley Prism
Maryville Olga	8022C	273	13	8,795	3·98	350·2	270	Jr. 3	342 ..	Victoria Generator B
Maryville Verna	Vol. 12	273	10½	6,459	4·71	304·2	230	Jr. 2	.. ..	Victoria Generator B
Carne, W. J., Pakenham Upper, Jersey (2).										
Wonga Park Songbird ..	74607	273	24	9,558	5·58	533·0	330	Sr. 4	404, 437, 491	Wonga Park Minx's Ace
Wonga Park Standard Rose	Vol. 20	273	17	6,674	5·56	371·3	230	Jr. 2	.. ..	Brampton Noble Standard (Imp.)
Chadderton, J. E., Hamilton, Jersey (1).										
Glen Leigh Destiny 2nd ..	43973	273	13	5,561	5·44	302·4	350	Mature	354, 381, 422, 399, 404, 397, 362	Glen Leigh Bounty
Chirnside, R. M., Whittlesea, Jersey (6).										
Mornmoot Fancy Starbright 3rd	63199	273	12	8,361	5·52	461·5	350	Mature	423, 530, 471	Werribee Maderia's Ace
Mornmoot Fancy Starbright 8th	77850	273	10½	6,349	5·82	369·4	230	Jr. 2	.. ..	Werribee Laverock
Mornmoot Princess Madeira 9th	58569	273	22½	10,635	6·13	652·1	350	Mature	426, 551, 661, 632	Werribee Warrior
Mornmoot Princess Madeira 17th	68097	273	20½	10,545	6·01	633·5	290	Sr. 3	449, 581 ..	War Valour (Imp.)
Mornmoot Satisfaction 9th	77856	273	12	5,993	5·63	337·7	230	Jr. 2	371 ..	Werribee Laverock
Werribee Alexia	79580	273	24	9,082	5·23	474·8	270	Jr. 3	371 ..	Werribee Rex
Clarke, F. W., Toora, Jersey (10).										
Mer Vue Butterball ..	67907	273	N.C.K.	7,376	5·74	423·1	350	Mature	360, 287, 408, 382	Berrington Largo
Mer Vue Butterball 2nd ..	77700	273	N.C.K.	5,415	7·36	398·6	310	Jr. 4	304 ..	Mer Vue Great Boy
Mer Vue Butterfly ..	67908	272	N.C.K.	7,034	5·27	370·8	350	Mature	413, 423, 442	Berrington Largo
Mer Vue Choice Contralto 4th	77702	272	N.C.K.	6,191	5·60	347·0	310	Jr. 4	299, 407 ..	Berrington Largo
Mer Vue Cissie 2nd ..	67912	273	N.C.K.	9,054	5·25	475·4	330	Sr. 4	325, 413, 468	Berrington Largo
Mer Vue Kathleen ..	82781	273	N.C.K.	6,401	5·44	348·1	290	Sr. 3	306 ..	Mer Vue Great Boy
Mer Vue Choice Soprano 4th	C.R.	210	..	3,570	5·84	208·5	250	Sr. 2	.. ..	Mer Vue Jupiter
Mer Vue Sweet Memories ..	67914	273	N.C.K.	5,375	5·93	318·8	350	Mature	272, 314 ..	Berrington Largo
Mer Vue Wee Doris 2nd ..	77707	273	N.C.K.	6,533	5·67	370·7	310	Jr. 4	312 ..	Mer Vue Student Lad
Mer Vue Trinket	82783	273	N.C.K.	7,050	5·73	404·3	310	Jr. 4	.. ..	Berrington Largo
Clark, P. W., Whittlesea, Jersey (9).										
Coodardy Centurian's Annette	70823	273	19½	7,974	5·12	408·5	350	Mature	345, 471 ..	Werribee Centurian
Coodardy Gentle Aldanesse	75740	273	15½	9,260	4·60	425·7	350	Mature	332, 462, 508	Staghorn Lord Aldan 3rd
Coodardy Gloria 5th ..	56871	273	18	8,279	5·47	452·5	350	Mature	360, 468, 572, 479	Kantara Don Juan
Mornmoot Fancy Madeira 6th	58563	273	32	9,164	4·88	447·4	350	Mature	424, 544, 544, 449	Werribee Madeira's Ace
Mornmoot Princess Madeira 14th	63204	273	16	8,075	5·09	410·9	350	Mature	372, 487, 533	Werribee Warrior
Mornmoot Fancy Starbright 7th	72945	273	7½	5,772	5·69	328·5	250	Sr. 2	315 ..	Glen Iris Golden Beau
Mornmoot Fancy Starbright 4th	63200	273	10½	6,722	6·05	406·7	330	Sr. 4	388, 547, 527	Werribee Warrior
Mornmoot Lady Twylish ..	77852	273	19	6,737	5·04	339·4	230	Jr. 2	.. ..	Staghorn Master Clement
Werribee Lillian	79584	273	11½	6,180	5·27	325·4	230	Jr. 2	.. ..	Staghorn Master Clement
Colenso, L. W. R., Alvie, Jersey (1).										
Normandie Ilma 12th ..	78137	273	18	7,676	4·05	311·0	270	Jr. 3	283 ..	Lewisham Playboy
Cook, D. E., Loch, Jersey (5).										
Wattle Vale Bais ..	Vol. 30	273	N.C.K.	4,475	5·04	225·5	230	Jr. 2	.. ..	Wattle Vale Headmaster
Wattle Vale Bright Eyes ..	69630	273	N.C.K.	4,029	6·03	243·0	350	Mature	366 ..	Ewolme Eileen's Northerner
Wattle Vale Crystal ..	Vol. 30	273	N.C.K.	5,039	4·86	244·7	230	Jr. 2	.. ..	Wattle Vale Limelight
Wattle Vale Magic ..	79544	273	N.C.K.	5,262	4·70	247·3	290	Sr. 3	198, 174 ..	Wattle Vale Golden Age
Wattle Vale Silky ..	Vol. 30	273	N.C.K.	3,654	5·62	205·3	230	Jr. 2	.. ..	Wattle Vale Limelight

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Coulthard, J. J., Whittlesea, Jersey (7).										
Walambra Begonia ..	84421	273	8	5,514	5·24	288·8	270	Jr. 3	350 ..	Clarendon Eyre Brigadier 3rd
Walambra Betsy ..	79434	273	8	5,379	5·42	291·6	310	Jr. 4	247, 257 ..	Selsey Wonderful Boy
Walambra Bonnie ..	Vol. 30	273	10	4,577	4·76	217·8	270	Jr. 3	243 ..	Airlie Don
Walambra Ladybird ..	39564	273	7	4,976	5·46	271·8	350	Mature	195, 259, 313, 359, 346	Clarendon Eyre Brigadier 3rd
Walambra Nellie Grey ..	88427	273	11	4,233	5·89	249·5	270	Jr. 3	359 ..	Airlie Don
Walambra Rosalie ..	84428	273	11½	5,877	5·51	323·9	310	Jr. 2	326, 351 ..	Selsey Wonderful Boy
Elmwood Gay Beauty 14th	Vol. 30	273	7	3,726	5·08	189·1	270	Jr. 3	255 ..	Elmwood Merry Boy
Cowan, G. L. S., Bacchus Marsh, Friesian (4).										
Upper Lappan Beth ..	Vol. 15	273	N.O.K.	11,166	3·42	382·2	290	Sr. 3	368 ..	Upper Lappan Pontiac
Upper Lappan Duchess ..	6068	273	N.O.K.	12,356	3·76	465·0	350	Mature	432, 445 ..	Polygon Bell's Springfield
Upper Lappan Edna ..	6069	273	26	11,345	3·55	402·9	330	Sr. 4	316, 378 ..	Elgin Glen Segis
Upper Lappan Romona 2nd	C.R.	273	N.O.K.	7,850	3·29	258·4	230	Jr. 2	.. ..	Upper Lappan Pontiac
Cuddihy, T. D., Geelong, Jersey (2).										
Mount Violet Molly Bawn	77888	273	N.O.K.	4,800	5·66	271·9	350	Mature	341 ..	Woodside Silver Count
Pivot Pearl 3rd	C.R.	273	N.O.K.	3,640	4·18	152·2	230	Jr. 2	.. ..	Pivot Billie
Dennis, Mrs. A. A., Frankston, Jersey (5).										
Ballam Gamboge Fancy ..	70127	273	8	5,279	5·99	316·2	310	Jr. 4	330 ..	The Wattles Gamboge Prince
Ballam Jeanette	60431	273	15	7,790	5·50	428·5	350	Mature	391, 487 ..	Somerville Preference
Ballam Lilac Dream ..	80090	273	22	6,636	5·99	397·8	230	Jr. 2	.. ..	Ballam Preference
Ballam Mary Rose ..	70129	273	11	8,403	4·96	416·4	270	Jr. 3	356 ..	The Wattles Gamboge Prince
Ballam Victory	60433	273	20	7,365	5·16	379·7	350	Mature	375, 419 ..	Somerville Preference
Department of Agriculture, Burnley, Jersey (2).										
Victoria Flirting Princess ..	74373	273	17	4,913	6·91	339·3	250	Sr. 2	328 ..	Selsey Spotted Prince
Victoria Princess Betty ..	59873	273	12	6,972	5·02	350·0	350	Mature	429, 456, 496, 361	Selsey Viola's Boy
Department of Agriculture, Werribee, Friesian (9).										
Victoria Amaza	Vol. 15	273	N.O.K.	8,676	3·36	291·4	230	Jr. 2	.. ..	Victoria Conductor
Victoria Belle	6075	240	N.O.K.	12,232	3·09	377·7	350	Mature	344, 457 ..	Rupertswood Inka Jo
Victoria Double Plebe ..	6082	273	N.O.K.	13,821	3·24	447·3	350	Mature	369, 493, 492, 485, 423	Victoria Double Top
Victoria Geisha	6084	273	N.O.K.	11,123	3·71	412·5	330	Sr. 4	334, 423 ..	Victoria Mikado
Victoria Gretna	Vol. 15	273	N.O.K.	10,381	3·76	390·0	230	Jr. 2	.. ..	Victoria Conductor
Victoria Joyce	Vol. 15	240 (Sold)	..	7,815	3·32	259·4	270	Jr. 3	261 ..	Victoria Ilka Jo
Victoria Rita	6097	273	N.O.K.	13,032	3·29	428·8	350	Mature	285, 468, 575	Rupertswood Inka Jo
Victoria Songbird ..	6098	210 (Sold)	..	8,595	3·26	279·8	350	Mature	260, 332, 388	Rupertswood Inka Jo
Victoria Song Maid ..	Vol. 15	273	N.O.K.	10,091	3·43	345·7	230	Jr. 2	.. ..	Victoria Conductor
Department of Agriculture, Werribee, Red Poll (16).										
Victoria Amabel	7003A	273	N.O.K.	9,582	4·10	393·3	350	Mature	287, 374 ..	Woodburn Peter Pan
Victoria Auxiliary ..	7954A	273	N.O.K.	5,910	5·44	321·5	270	Jr. 3	278 ..	Woodburn Peter Pan
Victoria Cassie	Vol. 12	273	N.O.K.	8,390	3·88	325·8	230	Jr. 2	.. ..	Victoria Petrology
Victoria Dumbell ..	Vol. 12	273	N.O.K.	5,604	4·67	261·7	250	Sr. 2	.. ..	Victoria Petrology
Victoria Janet	Vol. 12	273	N.O.K.	7,416	4·80	356·3	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Maiden	7584AA	273	N.O.K.	7,931	4·61	365·6	290	Sr. 3	325 ..	Chandpara Valentine
Victoria Mountain ..	7965A	273	N.O.K.	9,849	4·55	447·9	270	Jr. 3	367 ..	Woodburn Peter Pan
Victoria Pan Velvet ..	7586AA	273	N.O.K.	7,869	4·04	318·0	330	Sr. 4	409, 438 ..	Woodburn Peter Pan
Victoria Pan Waac ..	Vol. 12	273	N.O.K.	6,401	4·48	286·6	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Plum	7020A	273	N.O.K.	9,140	4·12	377·7	350	Mature	265, 315, 417, 395	Woodburn Peter Pan
Victoria Resist	Vol. 12	273	N.O.K.	7,091	4·21	298·3	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Rosea	Vol. 12	273	N.O.K.	6,824	4·15	282·9	290	Sr. 3	329 ..	Woodburn Peter Pan
Victoria Tambar ..	7974A	273	N.O.K.	8,703	4·70	409·0	330	Sr. 4	410, 470 ..	Woodburn Peter Pan
Victoria Trance	Vol. 12	210	N.O.K.	3,052	5·33	162·6	270	Jr. 3	238 ..	Victoria Petrology
Victoria Volt	4049B	273	N.O.K.	10,331	4·23	437·5	350	Mature	296, 369, 398, 515, 537, 512, 490, 437, 455	Victoria Vice Captain
Victoria Veena	Vol. 12	273	N.O.K.	7,917	4·64	367·6	230	Jr. 2	.. ..	Burnwood Masterpiece
Desmond, J. J., Rochester, Jersey (4).										
Macroom Edna's Lassie ..	82587	273	N.O.K.	6,795	6·00	407·7	310	Jr. 4	430 ..	Macroom Lassie's Mikado
Macroom Mary	77512	254	N.O.K.	7,215	4·99	360·2	270	Jr. 3	448 ..	Clifford Farm Robin Adair
Macroom Princess 3rd ..	72600	273	N.O.K.	7,503	6·08	455·9	330	Sr. 4	401 ..	Clifford Farm Robin Adair
View Bank's Bonnie Mary	64744	273	N.O.K.	9,966	5·89	586·7	350	Mature	322, 509 ..	View Bank's Bonnie Boy

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (11).										
Belgonia Design's Empire 3rd	60536	273	17½	6,034	4·58	278·6	350	Mature	242, 278, 334, 333	Design's Ruler (Imp.)
Belgonia Design's Noella 3rd	60538	273	N.C.K.	7,917	4·56	361·3	350	Mature	320, 421, 443, 462	Duke of the Lake (Imp.)
Kararra Duke's Eileen ..	82094	273	21½	8,420	6·13	516·4	250	Sr. 2	366 ..	Kararra Golden Duke
Kararra Oxford's Primrose	77081	273	14	7,330	5·88	431·2	270	Jr. 3	361 ..	Kararra Golden Oxford
Kararra Perree's Primrose	67355	273	22	9,186	6·08	558·3	350	Mature	420, 485, 527	Springhurst Perree's Quality
Kararra Standard Anemone	77085	273	14½	6,486	5·88	381·4	250	Sr. 2	319 ..	Brampton Sporting Standard (Imp.)
Kararra Standard Gem ..	77087	273	N.C.K.	6,281	5·77	362·3	270	Jr. 3	308 ..	Brampton Sporting Standard (Imp.)
Kararra Standard Noella ..	77089	240	4	4,815	6·49	312·3	270	Jr. 3	294 ..	Brampton Sporting Standard (Imp.)
Kararra Standard Perree ..	77090	273	N.C.K.	4,900	6·13	300·2	270	Jr. 3	264 ..	Brampton Sporting Standard (Imp.)
Kararra Standard Tecoma	77091	273	11	6,903	6·10	421·0	270	Jr. 3	357 ..	Brampton Sporting Standard (Imp.)
Sutton Lea Eline ..	74031	240	4	10,222	4·44	453·4	350	Mature	286, 480, 484	Staghorn Prince Aldan
Dookie Agricultural College, Dookie, Ayrshire (2).										
Dookie Bebe	32243	273	N.C.K.	6,515	4·23	278·9	350	Mature	325, 412 ..	Tregorland Indispensible
Dookie Patricia	35373	273	N.C.K.	4,851	3·95	191·7	250	Sr. 2	.. ..	Dookie Radium
Doyle, Dr. G., Arthur's Creek, Jersey (1).										
Maxmount Lady Alice ..	67846	273	4	5,574	5·31	296·1	350	Mature	.. ..	Maxmount Fowler's Surprise
Dunmore, T. J., Melton, Jersey (6).										
Laura Dell Blonde Lady ..	82372	273	12	4,406	5·90	260·0	230	Jr. 2	.. ..	Muswell Masterpiece
Laura Dell Gladena ..	72360	273	14½	7,142	5·75	410·9	330	Sr. 4	359, 429 ..	Avalon Gladstar 34th
Laura Dell Glowena ..	77291	273	14½	5,895	5·67	334·2	270	Jr. 3	242 ..	Muswell Reflection
Laura Dell Glowette ..	Vol. 30	273	11½	3,500	6·10	213·4	230	Jr. 2	.. ..	Muswell Reflection
Laura Dell Glow Rose ..	82373	273	17	5,406	5·74	310·4	230	Jr. 2	.. ..	Muswell Reflection
Laura Dell Lillibet ..	72361	273	20	7,492	6·17	462·0	350	Mature	407, 462 ..	Clarendon Eyre Eminent's L'Aiglon
Eltringham, W. B., Lilydale, Jersey (1).										
Clifford Farm Marina ..	70728	273	24	9,642	5·09	491·2	350	Mature	406, 446, 443	Clifford Farm Danny Boy
Enders, N. H., Stanhope, Jersey (1).										
Selsey Golden Lily 2nd ..	69061	273	12	8,556	5·73	490·0	350	Mature	400, 458, 531	Samares Golden Prince (Imp.)
Everist, F. R., Tyabb, Red Poll (4).										
Chota Wallah Dawn ..	Vol. 12	240	4	4,860	4·04	196·2	270	Jr. 3	235 ..	Bundure Winter
Chota Wallah Poppy ..	Vol. 12	273	N.C.K.	4,208	4·58	192·6	270	Jr. 3	189 ..	Northwood Rangi
Chota Wallah Vicereine ..	7680A	273	N.C.K.	4,730	4·58	216·4	310	Jr. 4	178, 210 ..	Victoria Gallant
Chota Wallah Vintage ..	Vol. 12	273	N.C.K.	3,362	4·37	147·0	230	Jr. 2	.. ..	Northwood Rangi
Fairchild and Clutterbuck, Tinamba, Jersey (12).										
Keyuga Beth	67421	273	N.C.K.	7,392	4·49	332·1	350	Mature	278, 324, 331	Keyuga Bold Pilot
Rowallan Silvermine 4th ..	64128	273	N.C.K.	7,305	4·99	364·7	350	Mature	400, 436, 422	Banyule Comet
Vaucluse Blossom 3rd ..	84381	273	N.C.K.	6,194	5·62	348·2	330	Sr. 4	394 ..	Paisley Master
Vaucluse Butterfly 2nd ..	Vol. 30	273	N.C.K.	4,925	5·67	279·1	230	Jr. 2	.. ..	Vaucluse Master 6th
Vaucluse Daphne 2nd ..	65922	240	N.C.K.	4,620	4·97	229·3	350	Mature	326, 293, 391, 356	Glen Iris Violin
Vaucluse Daphne 4th ..	79403	273	N.C.K.	7,311	5·10	372·9	290	Sr. 3	318, 351 ..	Vaucluse Masterpiece
Vaucluse Empress 7th ..	79405	273	N.C.K.	7,430	5·15	382·7	290	Sr. 3	298, 410 ..	Vaucluse Masterpiece
Vaucluse Flower 3rd ..	84385	273	N.C.K.	7,929	5·51	436·7	270	Jr. 3	374 ..	Vaucluse Masterpiece
Vaucluse Madrigal 2nd ..	84387	273	N.C.K.	8,739	5·31	464·4	310	Jr. 4	462 ..	Paisley Master
Vaucluse Marie Rose 2nd ..	84388	273	N.C.K.	9,024	5·11	460·9	270	Jr. 3	322 ..	Vaucluse Masterpiece
Vaucluse Tassel	Vol. 30	273	N.C.K.	5,394	5·03	271·1	230	Jr. 2	.. ..	Vaucluse Masterpiece
Vaucluse Tilly 2nd ..	C.R.	273	N.C.K.	8,550	4·36	372·9	290	Sr. 3	319, 337 ..	Vaucluse Masterpiece
Fixter, A., Boisdale, Guernsey (2).										
Avonview Edna	8272	273	17	7,088	5·85	414·3	270	Jr. 3	346 ..	Avonview Monogram 8th
Avonview Runica's Winnie	Vol. 14	273	15	5,754	5·34	307·3	230	Jr. 2	.. ..	Avonview Monogram 12th
Gay, R. G., and Son, Yarram, Jersey (6).										
Elm Grove Buttercup 3rd	61461	273	N.C.K.	6,945	5·25	364·8	350	Mature	264, 499, 459	Elm Grove Graceful Masterpiece
Elm Grove Golden Silverbelle	Vol. 30	273	N.C.K.	5,093	5·92	301·6	250	Sr. 2	.. ..	Elm Grove Gold Star
Elm Grove Island Maid 3rd	81191	273	N.C.K.	7,628	5·65	430·8	310	Jr. 4	506 ..	Glen Iris Golden Man
Elm Grove Orchid 2nd ..	81195	273	N.C.K.	7,749	6·79	525·8	270	Jr. 3	320 ..	Gold Star of Melrose
Elm Grove Veronica ..	Vol. 30	273	N.C.K.	6,708	5·72	383·5	250	Sr. 2	.. ..	Staghorn Clementine Noble 3rd
Selsey Royal Rose ..	83881	273	N.C.K.	5,232	5·20	272·1	230	Jr. 2	.. ..	Selsey Right Royal

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.		Sire.
Grice, C. S., Somerville, Jersey (2).											
Belgonia Suspense 6th ..	56325	273	14	8,219	5·62	461·9	350	Mature	413, 478, 481, 546, 615		Design's Ruler (Imp.)
Glenoma Princess Madeira	81511	273	11	4,998	6·49	324·6	230	Jr. 2	..	..	War Valour (Imp.)
Handbury, J. E., and Son, Toora, Jersey (6).											
Tooravale Lassie 42nd ..	84243	273	N.C.K.	5,991	5·67	339·9	270	Jr. 3	291	..	Glen Iris Dandy's Sultan
Tooravale March Galintha	Vol. 30	273	N.C.K.	4,364	6·35	277·0	230	Jr. 2	..	..	Pinewood's Aristocrat (Imp.)
Tooravale Princess 40th ..	84248	273	N.C.K.	7,667	5·83	446·7	270	Jr. 3	329	..	Pinewood's Aristocrat (Imp.)
Tooravale Princess 44th ..	Vol. 30	273	N.C.K.	4,670	6·19	289·1	230	Jr. 2	..	..	Colyton Dandy's Aristocrat
Tooravale Princess 45th ..	Vol. 30	273	N.C.K.	4,463	6·20	276·5	230	Jr. 2	..	..	Pinewood's Aristocrat
Tooravale Princess 46th ..	Vol. 30	273	N.C.K.	5,063	5·67	287·1	230	Jr. 2	..	..	Pinewood's Aristocrat
Hardie, R. B., Lardner, Jersey (1).											
Glen Urquart Princess ..	81458	273	13	7,340	5·39	395·4	270	Jr. 3	360	..	Tooravale Alpha
Harvey, T., Boisdale, Jersey (10).											
Jerseyholm Bluebell 37th ..	62308	273	N.C.K.	6,944	5·76	400·1	350	Mature	358, 301, 336		Banyule Biplane
Jerseyholm Bluebell 38th ..	67185	273	N.C.K.	6,668	5·32	354·7	330	Sr. 4	262, 241, 268		Banyule Biplane
Jerseyholm Bluebell 39th ..	67186	273	N.C.K.	8,311	5·76	478·3	350	Mature	332, 345, 322		Rowallan Silvanite
Jerseyholm Bluebell 47th ..	71962	273	N.C.K.	7,798	5·59	436·1	290	Sr. 3	320, 330	..	Glen Iris Royal Archer
Jerseyholm Empress 48th ..	57846	273	N.C.K.	9,363	5·26	492·3	350	Mature	337, 395, 430, 350		Jerseyholm Master Fox 6th
Jerseyholm Empress 55th ..	62312	273	N.C.K.	9,528	4·81	458·0	350	Mature	346, 371	..	Mornmoot Mars
Jerseyholm Empress 58th ..	62313	273	N.C.K.	6,248	5·71	356·5	350	Mature	253, 240, 254		Banyule Biplane
Jerseyholm Empress 65th ..	71969	273	N.C.K.	7,734	4·71	364·1	310	Jr. 4	233, 297	..	Orphanage Molly's Commander
Jerseyholm Empress 66th ..	71970	273	N.C.K.	6,636	5·58	370·2	290	Sr. 3	302	..	Orphanage Molly's Commander
Jerseyholm Kirsty 40th ..	71976	273	N.C.K.	5,972	5·64	337·0	270	Jr. 3	330	..	Orphanage Molly's Commander
Haywood, Dr. A. R., Hastings, Jersey (9).											
Anemone's Love (Imp.) ..	42695	273	N.C.K.	7,073	4·74	335·5	350	Mature	352, 428, 502		Anemone's Lily Oxford
Glen Iris Royal Viola ..	71422	273	N.C.K.	6,561	5·40	354·3	350	Mature	323, 426, 495		Glen Iris Royal Gallant
Windrest Chevy	42529	273	N.C.K.	6,533	4·89	319·3	350	Mature	251, 359, 289, 337, 413, 398, 427, 561, 567		Edmonton Rarius
Windrest Chevy 3rd ..	74575	273	N.C.K.	7,745	5·49	425·0	350	Mature	374, 484, 551		Gadget (Imp.)
Windrest Chevy's Choice ..	84588	273	9½	7,027	5·19	364·4	270	Jr. 3	453	..	Gadget (Imp.)
Windrest Chevy's Delight ..	79657	273	N.C.K.	4,769	6·55	312·2	310	Jr. 4	473, 488	..	Gadget (Imp.)
Windrest Chevy's Matilda 2nd	Vol. 30	273	N.C.K.	6,332	4·83	306·1	230	Jr. 2	..	..	Gadget (Imp.)
Windrest Gay Marie 2nd ..	74578	273	N.C.K.	6,663	5·66	377·0	350	Mature	402, 512, 648		Gadget (Imp.)
Windrest Rose Marie 2nd ..	74581	273	N.C.K.	5,645	6·34	357·9	350	Mature	237, 317, 408, 466		Windrest Prince Madeira
Higgins, J. A. A., Keysborough, Guernsey (3).											
Brighton Vale Dainty Maid	Vol. 15	273	11	5,013	5·48	274·5	230	Jr. 2	..	..	Melbourne Morland's Raymond
Brighton Vale De Lys ..	8363	273	8	4,808	4·70	226·1	310	Jr. 4	186, 344	..	Melbourne Golden Power
Brighton Vale Marie ..	8371	273	14	6,267	5·35	335·3	270	Jr. 3	..	..	Melbourne Alain D'Or
Hodgins, G. E., Hastings, Jersey (3).											
Verjean Viscountess ..	74367	273	13	6,579	5·28	347·7	290	Sr. 3	265, 346	..	Ardleigh Prince Chut
Verjean Vocaliste	Vol. 30	273	14	5,190	5·59	290·1	230	Jr. 2	..	..	Selsey Royal Chief
Verjean Vontorson ..	74369	273	14	6,734	4·92	331·6	310	Jr. 4	341, 335	..	Jorian Great Boy
Hore, E., Leitchville, Jersey (1).											
The Wattles Silvermine 9th	74169	273	N.C.K.	6,516	5·71	372·3	310	Jr. 4	345, 435	..	The Wattles Young Gamboge
Hore, M. T., Horfield, Friesian (7).											
Elmar Flora	App. I. Vol. 15	273	N.C.K.	9,006	3·42	308·1	270	Jr. 3	..	..	Elmar Sylvia's Lad
Elmar Kitty	Vol. 15	273	N.C.K.	7,119	3·19	226·9	230	Jr. 2	..	..	Elmar Roseberry
Elmar Trixie	Vol. 15	273	N.C.K.	12,119	3·24	392·3	350	Mature	240, 386, 411, 327		Elmar Sylvia's Lad
Kelvale Blondie	Vol. 15	273	N.C.K.	7,070	3·68	260·3	230	Jr. 2	..	..	Kelvale Ian Bainfield
Kelvale Lady Netherland ..	Vol. 15	273	N.C.K.	8,213	3·27	268·9	230	Jr. 2	..	..	Kelvale Aristocrat
Kelvale Mona	Vol. 15	273	N.C.K.	7,367	4·43	326·6	230	Jr. 2	..	..	Kelvale Ian Bainfield
Kelvale Patsy	Vol. 15	273	N.C.K.	6,170	3·62	223·6	230	Jr. 2	..	..	Kelvale Ian Bainfield
Huffer, J. A., Gormandale, Jersey (4).											
Glenvalley Gladys ..	C.R.	273	N.C.K.	7,920	5·05	399·8	290	Sr. 3	285, 369	..	Yuleba Fancy Twylish 3rd
Glenvalley Handsome Girl 6th	71544	273	N.C.K.	5,834	5·89	343·4	350	Mature	284, 330, 366		Glenvalley Mercedes Chief
Glenvalley Mercedes Satisfaction	71546	273	N.C.K.	7,830	4·78	374·1	350	Mature	299, 416	..	Glenvalley Mercedes Chief
Glenvalley Waverley Lass 9th	76539	273	N.C.K.	7,088	5·92	419·8	290	Sr. 3	332, 418	..	Yuleba Fancy Twylish 3rd

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Hurrey, Estate of the late W. H., Koonwarra, Jersey (8).										
Burwood Mourier Bell 2nd	60930	273	10	5,175	6·35	328·5	350	Mature	275, 337, 291, 374, 384	Kooreena Handsome Lad
Kooreena Audrey 7th ..	49031	273	12	5,675	6·33	359·1	350	Mature	343, 435, 381, 426, 299, 473	Kooreena Carrie 3rd Delegate
Kooreena Carrie 9th ..	67482	273	10	5,370	5·96	320·0	350	Mature	381, 374, 355	Kooreena Good Luck
Kooreena Lady 7th's Choice	Vol. 30	273	10	4,278	6·03	260·2	290	Sr. 3	279, 323 ..	Kooreena Carrie 4th's Laddie
Kooreena Luck's Belle ..	Vol. 30	273	13½	5,771	6·06	350·0	350	Mature	342 ..	Kooreena Good Luck
Kooreena Merle	C.R.	273	9	4,744	6·82	323·5	250	Sr. 2	257 ..	Kooreena Carrie 4th's Laddie
Kooreena Yo Yo 8th ..	Vol. 30	273	9	4,662	7·06	329·0	270	Jr. 3	326 ..	Kooreena Carrie 4th's Laddie
Kooreena Yo Yo 9th ..	Vol. 30	273	13½	4,958	6·61	327·8	250	Sr. 2	.. ..	Kooreena Rover 3rd
Jackson, H., Lockington, Jersey (1).										
Pine Ridge Molly ..	63731	240	4	8,632	5·61	484·1	350	Mature	285, 408, 471, 545	Duke of the Lake (Imp.)
Jeffreson, E. L., Narre Warren, Jersey (7).										
Barrowby Briar Rose ..	60508	273	15	6,315	4·58	289·5	350	Mature	303, 424, 411, 292, 289	Barrowby Sonny
Barrowby Rose Fancy ..	56280	273	18	8,152	5·15	419·9	350	Mature	316, 383, 511, 541, 369, 272	Wompini Twylight
Barrowby Rose Madeira ..	Vol. 30	273	9	4,376	5·67	248·0	230	Jr. 2	.. ..	Mornmoot Marmoot 2nd
Barrowby Rose Midget ..	65357	273	10	6,952	5·73	398·4	330	Sr. 4	340, 436, 383	Mornmoot Meteor
Finchley Handsome Girl 2nd	66458	240	4	3,585	6·92	248·2	330	Sr. 4	344, 204, 177	Finchley Vasilika's Masterpiece
Finchley Lady Burnham ..	48129	273	11	5,073	6·46	327·9	350	Mature	328, 384, 436, 359, 276	Werribee Lord Burnham
Hildason Rose Marie ..	Vol. 30	273	7	3,728	5·19	193·6	230	Jr. 2	.. ..	Mornmoot Marmoot 2nd
Johnson, F. G., Horsham, Jersey (4).										
Firebrace Lady	76231	273	N.C.K.	4,206	5·36	225·4	290	Sr. 3	226 ..	Orphanage Lady's Vanguard
Firebrace Molly	76232	273	N.C.K.	5,727	4·74	271·5	270	Jr. 3	251 ..	Orphanage Lady's Vanguard
Orphanage Mirthmaker 10th	83294	273	N.C.K.	4,910	5·19	254·7	270	Jr. 3	246 ..	Banyule Terraplane
Orphanage Molly 14th ..	83296	210	N.C.K.	3,420	5·08	173·9	270	Jr. 3	256 ..	Banyule Bungana
Keele, H. A., Bamawm Extension, Jersey (1).										
Waroin Wasp	55791	273	N.C.K.	8,322	5·30	440·9	350	Mature	462 ..	Maiwand Noble Duke
Langlands, F. B., Horsham, Jersey (5).										
Brierwood Clementine's Petal	75349	273	N.C.K.	6,242	5·28	329·4	310	Jr. 4	336, 329 ..	Murona Twylair
Brierwood Flower Girl 6th	70482	273	N.C.K.	9,426	4·62	435·7	310	Jr. 4	368 ..	Murona Twylair
Brierwood Twylish Countess	75354	273	N.C.K.	6,391	5·23	334·1	270	Jr. 3	251 ..	Murona Twylair
Brierwood Vanity ..	70483	273	N.C.K.	6,192	5·36	331·6	350	Mature	312, 407 ..	Murona Twylair
Brierwood Vanity 2n ..	75356	273	N.C.K.	5,390	5·17	278·6	270	Jr. 3	183 ..	Orphanage Lady's Vanguard
Le Noury, E., Werribee South, Guernsey (7).										
Cleveland Melody ..	6827	273	N.C.K.	6,643	5·12	340·2	350	Mature	284, 246 ..	Melbourne Peter Pan
Werribee Lady's Maid ..	Vol. 14	273	N.C.K.	4,079	5·07	206·8	230	Jr. 2	.. ..	Werribee Prince Don
Werribee Mermaid ..	9638	240	N.C.K.	4,710	4·81	226·4	270	Jr. 3	291 ..	Warrawong Wretch
Werribee Miss Pat ..	9639	273	N.C.K.	6,360	4·32	274·9	270	Jr. 3	310 ..	Warrawong Wretch
Werribee Patsy Sequel ..	Vol. 14	273	N.C.K.	3,602	4·84	174·2	230	Jr. 2	.. ..	Werribee Prince Don
Werribee Princess Patsy ..	6485	273	N.C.K.	5,667	4·65	263·7	350	Mature	237, 224, 300	Werribee Prince Don
Werribee Royal Maid ..	9642	273	N.C.K.	6,891	5·00	344·6	310	Jr. 4	232, 333 ..	Werribee Prince Don
Lind, A. E. and Sons, Mount Taylor, Jersey (2).										
Latrobe Statuette 7th ..	53708	273	13	8,014	5·46	437·9	350	Mature	.. ..	Banyule Biplane
Sunny Dell Air Hostess ..	Vol. 30	273	15	6,248	5·71	356·6	230	Jr. 2	.. ..	Banyule Mollison
Linke, H. P., Tarrington, Dairy Shorthorn (6).										
Corresdean Lila 2nd ..	1791E	273	14	8,910	3·98	354·8	270	Jr. 3	255 ..	Drumneil Prince 3rd
Corresdean Princess ..	1794E	273	24½	8,731	3·52	307·1	270	Jr. 3	242 ..	Drumneil Prince 3rd
Corresdean Ruby ..	1797E	273	31½	9,660	3·55	343·1	350	Mature	321, 336 ..	Willow Park Revenue 2nd
Corresdean Snowy ..	1798E	273	12	10,317	3·42	353·2	350	Mature	376 ..	Willow Park Revenue 2nd
Drumneil Daisy 4th ..	1836E	273	17	8,091	3·45	278·9	350	Mature	288, 352, 203	Willow Park Lustre 3rd
Drumneil Pearl 4th ..	1851E	273	17	7,309	3·74	273·4	310	Jr. 4	231, 218 ..	Willow Park Lustre 3rd
Longerenong Agricultural College, Dooen, Ayrshire (4).										
Longerenong Cootamundra Wattle 6th	32770	273	8	6,249	4·12	257·3	310	Jr. 4	233 ..	Dookie Signet
Longerenong Cootamundra Wattle 7th	32771	273	9	5,879	4·56	267·9	310	Jr. 4	259, 348 ..	Dookie Signet
Longerenong Cootamundra Wattle 11th	34854	273	11	4,566	4·56	208·0	230	Jr. 2	.. ..	Dookie Signet
Longerenong Lauristine 5th	33865	273	13	5,201	3·94	204·8	230	Jr. 2	.. ..	Dookie Signet

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Lyon, Estate of the late W. H., Sale, Jersey (16).										
Avon Blue Bell	74945	273	N.C.K.	5,814	6·37	370·2	350	Mature	227, 395 ..	Ruby's Beau (Imp.)
Avon Bracken	Vol. 30	273	N.C.K.	7,901	6·06	478·5	270	Jr. 3	376 ..	Ruby's Beau (Imp.)
Avon Dawn	65244	273	N.C.K.	7,461	6·29	469·5	350	Mature	392, 444 ..	Ruby's Beau (Imp.)
Avon Dianthus	80039	273	N.C.K.	7,584	5·32	403·4	330	Sr. 4	303, 415 ..	Avon Ruby's Count
Avon Dodo	70073	273	N.C.K.	7,335	5·86	430·1	350	Mature	413, 503 ..	Ruby's Beau (Imp.)
Avon Dorothy 3rd ..	C.R.	273	N.C.K.	3,045	6·02	183·2	230	Jr. 2	.. ..	Avon Bandolier
Avon Dusk	Vol. 30	273	N.C.K.	6,296	6·61	416·3	290	Sr. 3	339 ..	Ruby's Beau (Imp.)
Avon Electors Girl ..	C.R.	273	N.C.K.	3,830	5·15	197·1	230	Jr. 2	.. ..	Studleigh Lord's Madeira
Avon Gilded Lassie ..	C.R.	273	N.C.K.	4,557	5·32	242·3	250	Sr. 2	.. ..	Avon Bandolier
Avon Jasmine	74851	273	N.C.K.	11,532	6·16	709·9	350	Mature	438, 626 ..	Ruby's Beau (Imp.)
Avon Lady Love ..	65246	273	N.C.K.	4,955	5·73	283·8	350	Mature	368, 410 ..	Ruby's Beau (Imp.)
Avon Myrtle	C.R.	273	N.C.K.	3,938	6·26	246·5	230	Jr. 2	.. ..	Avon Bandolier
Avon Nectarine	C.R.	240	N.C.K.	2,985	4·97	148·4	230	Jr. 2	.. ..	Avon Bandolier
Avon Nemesia 2nd ..	80044	273	N.C.K.	8,082	6·22	502·5	290	Sr. 3	400 ..	Ruby's Beau (Imp.)
Avon Pink May	C.R.	150	N.C.K.	2,340	5·63	131·7	230	Jr. 2	.. ..	Avon Bandolier
Avon Twilight	Vol. 30	273	N.C.K.	4,248	5·28	224·4	230	Jr. 2	.. ..	Ruby's Beau (Imp.)
Macauley, C. W., Rochester, Jersey (6).										
Taranah Chime 4th ..	C.R.	273	N.C.K.	5,031	5·99	301·6	270	Jr. 3	256 ..	Taranah Champion
Taranah Chime 5th ..	Vol. 30	273	N.C.K.	7,620	5·35	407·7	270	Jr. 3	297 ..	Werribee Twylish Master
Taranah Fair Lady 5th ..	84105	273	N.C.K.	5,567	5·36	298·6	310	Jr. 4	316, 298 ..	Taranah Champion
Taranah Flora 8th ..	C.R.	180	N.C.K.	2,130	6·25	133·1	230	Jr. 2	.. ..	Five Gums King Lark
Taranah Floss 6th ..	84108	273	N.C.K.	4,944	5·70	281·6	250	Sr. 2	260 ..	Werribee Twylish Master
Taranah Rarity 4th ..	C.R.	210	N.C.K.	3,030	5·71	172·9	230	Jr. 2	.. ..	Taranah Dignity
McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (3).										
Selsey Royal Lily 2nd ..	78883	273	18	6,386	5·39	344·1	270	Jr. 3	263 ..	Selsey Right Royal
Spring Valley Euphorbia 2nd	78921	273	13	5,706	5·59	318·9	310	Jr. 4	302 ..	Selsey Great Peer
Spring Valley Vanilla ..	Vol. 30	273	10½	4,735	4·81	227·9	230	Jr. 2	.. ..	Selsey Gay Prince
McNabb, G. A., and Son, Irrewillipe East, Jersey (3).										
Maxon Bright Ranunculus	77618	273	N.C.K.	6,195	5·61	347·6	270	Jr. 3	295 ..	Maxon Starbright Prince 5th
Maxon D's Clara	82701	273	N.C.K.	5,664	4·96	281·2	250	Sr. 2	250 ..	Maxon Count's Dawn
Maxon D's Favourite 3rd ..	82706	273	N.C.K.	4,756	5·14	244·3	230	Jr. 2	.. ..	Maxon Count's Dawn
Maher, R. H., Tongala, Jersey (9).										
Rosemont Daisy 7th ..	73758	273	N.C.K.	7,312	5·41	395·6	350	Mature	325, 352 ..	Rosemont Laddie Fowler 3rd
Rosemont Jenny Lind 14th	73760	273	N.C.K.	5,921	5·11	302·3	350	Mature	260, 275 ..	Rosemont Volunteer
Rosemont Lady Fowler 30th	Vol. 30	273	N.C.K.	4,359	6·28	273·9	270	Jr. 3	.. ..	Belgonia Perree
Rosemont Lady Fowler 41st	Vol. 30	273	N.C.K.	4,719	5·41	255·3	230	Jr. 3	.. ..	Belgonia Aim High
Rosemont Laura 11th ..	78714	273	N.C.K.	5,830	5·26	306·9	350	Mature	269 ..	Belgonia Perree
Rosemont Primrose 6th ..	64065	273	N.C.K.	5,968	4·58	273·1	350	Mature	339, 403, 426, 413	Rosemont Laddie Fowler 3rd
Rosemont Primrose 9th ..	78716	273	N.C.K.	7,803	5·18	404·1	350	Mature	353 ..	Belgonia Perree
Rosemont Primrose 10th ..	83733	273	N.C.K.	7,487	5·63	421·4	310	Jr. 4	288 ..	Belgonia Perree
Rosemont Silvermine 12th	73767	273	N.C.K.	7,038	4·79	337·3	350	Mature	.. ..	Belgonia Perree
Maloney, P. J., Tongala, Jersey (6).										
Belgonia Buttercup 5th ..	70222	273	N.C.K.	6,860	5·65	387·6	350	Mature	402, 486, 458	Aim High (Imp.)
Belgonia Eileen 8th ..	70227	273	N.C.K.	8,000	5·12	409·6	350	Mature	362, 397 ..	Aim High (Imp.)
Belgonia Gem's Noella 8th	80217	273	N.C.K.	6,885	6·30	433·5	230	Jr. 2	.. ..	Baron Design (Imp.)
Belgonia Junette 7th ..	70235	273	N.C.K.	9,710	6·14	596·2	310	Jr. 4	418, 560 ..	Aim High (Imp.)
Belgonia Peggy 20th ..	70243	273	N.C.K.	6,707	5·00	335·3	350	Mature	425, 355, 471	Aim High (Imp.)
Belgonia Peggy 31st ..	80225	273	N.C.K.	7,371	5·66	417·1	230	Jr. 2	.. ..	Baron Design (Imp.)
Mason, V. J., Ferntree Gully, Guernsey (1).										
Osmaine Prudence ..	9207	273	N.C.K.	5,715	6·18	353·0	230	Jr. 2	.. ..	Yarraview Masher
Masters, S. H., and Son, Swan Hill, Jersey (3).										
Rutland Brunette 16th ..	64153	273	15	9,677	5·36	518·4	350	Mature	363, 454, 521, 624, 618	King's Vale Lauder
Rutland Brunette 20th ..	69028	273	15	8,657	5·87	507·9	350	Mature	390, 482, 534	Selsey Fashion Boy
Rutland Brunette 21st ..	78806	273	18	9,416	4·95	466·1	310	Jr. 4	322, 380 ..	King's Vale Lauder
Meaklim Bros., Mooroopna, Dairy Shorthorns (11).										
Drumneil Beauty 7th ..	C.C.	273	N.C.K.	7,161	3·50	250·5	230	Jr. 2	.. ..	Willow Park Barrington 46th
Drumneil Daisy 3rd ..	1839E	273	N.C.K.	10,725	3·76	403·5	350	Mature	320, 323, 353	Willow Park Lustre 3rd
Drumneil Daisy 5th ..	C.C.	273	8	7,119	3·68	261·7	270	Jr. 3	338 ..	Willow Park Barrington 46th
Drumneil Dulcie	1839E	273	N.C.K.	9,273	3·11	288·7	350	Mature	312, 251, 339	Willow Park Lustre 3rd
Drumneil Dulcie 2nd ..	1840E	273	N.C.K.	9,128	3·35	306·0	290	Sr. 3	275 ..	Willow Park Barrington 46th
Drumneil Fairy 6th ..	1842E	273	N.C.K.	8,942	3·79	339·0	310	Jr. 4	299, 298 ..	Willow Park Lustre 3rd
Drumneil Ida 2nd ..	C.C.	273	N.C.K.	9,102	3·37	306·6	270	Jr. 3	285 ..	Willow Park Barrington 46th
Drumneil Lily 2nd ..	1846E	273	N.C.K.	10,500	3·91	410·1	350	Mature	322, 476, 447, 471	Willow Park Lustre 3rd
Drumneil Lily 3rd ..	C.C.	273	N.C.K.	10,620	3·31	352·0	290	Sr. 3	318 ..	Willow Park Barrington 46th
Drumneil Princess 7th ..	1854E	273	N.C.K.	9,798	4·19	410·1	350	Mature	314, 371, 388	Willow Park Lustre 3rd
Drumneil Rosebud ..	C.C.	273	N.C.K.	8,847	3·16	279·7	230	Jr. 2	.. ..	Willow Park Barrington 46th

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Methodist Central Mission, Lilydale, Guernsey (3).										
Melbourne Anemone ..	7397	273	13	9,446	4·53	427·5	350	Mature	174, 292 ..	Yarraview Sequel's Slogan
Melbourne Lucille ..	7445	273	7	6,471	4·44	287·2	350	Mature	192, 263, 380	Yarraview Sequel's Slogan
Tally Ho Golden Locks ..	Vol. 14	273	14	4,984	5·41	269·6	250	Sr. 2	285 ..	Yarraview Fakir
Mitchell, R. H., Linton, Jersey (4).										
Clifford Farm Belladonna ..	56817	273	7	7,930	5·34	423·4	350	Mature	490, 401, 474, 481	Wompini V.C.
Clifford Farm Gladsome ..	32965	273	19	8,644	6·35	548·6	350	Mature	411, 465, 472, 367	Clifford Farm Eliminator
Clifford Farm Ladybird ..	80741	273	19	6,971	5·57	388·3	270	Jr. 3	387 ..	Clifford Farm Danny Boy
Clifford Farm Rose Marie ..	75664	273	22	7,913	5·02	397·4	330	Sr. 4	363, 386 ..	Clifford Farm Flashlight
Moore, J. and Co., Yarram, Jersey (2).										
Lumeah Wildflower 2nd ..	72529	273	N.O.K.	6,440	4·60	296·2	350	Mature	277, 293 ..	Hazelgrange Minnie's Master
Tooloonook Molly 15th ..	79249	273	N.O.K.	4,860	5·87	285·3	350	Mature	312, 218, 293	Latrobe Musician
Murdoch, J., and Son, Lismore, Jersey (1).										
Ismalia Petal 9th ..	Vol. 30	273	N.O.K.	3,988	4·96	197·8	230	Jr. 2	.. ..	Banyule Bungana
Nancarrow Bros., Kerang, Jersey (2).										
Pine Ridge Lady 2nd ..	83472	273	N.O.K.	6,334	5·13	325·0	230	Jr. 2	.. ..	Belgonia Peggy 9th's King
Pine Ridge Rose Dream ..	63732	273	N.O.K.	8,804	4·78	420·6	350	Mature	241, 408, 401, 483	Duke of the Lake (Imp.)
Nicholas, M. A., Sherbrooke, Jersey (4).										
Selsey Golden Rose ..	69062	273	16½	7,626	5·06	385·5	350	Mature	322, 361, 332	Samare's Golden Prince (Imp.)
Selsey Golden Rose 2nd ..	78877	273	6½	4,130	5·99	247·5	250	Sr. 3	320 ..	Samare's Golden Prince (Imp.)
Selsey Roseleaf 3rd ..	59413	273	18	5,943	4·95	293·9	350	Mature	335, 308, 299, 427, 292	Brampton Great Boy (Imp.)
Selsey Samare's Roseleaf ..	73885	273	18½	6,713	6·54	439·1	310	Jr. 4	360, 410 ..	Samare's Golden Prince (Imp.)
Nicholson, A. N., Moorooduc, Illawarra, Shorthorn (1).										
Veresdale Heath	33740	273	10½	6,635	3·19	211·6	270	Jr. 3	250 ..	Ovensdale Pearl's Renown
Noonan, G., Benalla, Jersey (1).										
The Wattles Petal 11th ..	84195	273	21	7,873	5·12	403·4	230	Jr. 2	.. ..	Belgonia Design's Aim
O'Neill, J., Echuca Village, Jersey (4).										
Ullina Countess	84338	273	13	5,211	6·74	351·4	270	Jr. 3	339 ..	Mornmoot Satisfaction's Warrior
Ullina Dorothy	84339	273	15½	6,504	6·35	412·8	250	Sr. 2	326 ..	Mornmoot Satisfaction's Warrior
Ullina Princess Rose ..	74312	273	15	7,025	5·68	399·0	330	Sr. 4	355, 421, 429	Melrose Outlook
Ullina Yvonne	74313	273	14	6,837	5·22	375·1	350	Mature	332, 382, 334	Ballara Fancy's King
Parker, L. M., Tallarook, Dairy Shorthorn (5).										
Deep Dale Elizabeth 2nd ..	C.C.	273	12	4,316	4·06	175·4	230	Jr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Peach 2nd ..	C.C.	273	15	5,280	3·93	207·3	250	Sr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Pearl 2nd ..	C.C.	273	17	5,916	3·70	219·0	250	Sr. 2	.. ..	Willow Park Barrington 26th
Deep Dale Polly 2nd ..	C.C.	273	20	8,846	4·02	355·3	310	Jr. 4	295 ..	Willow Park Barrington 26th
Deep Dale Susie	1822E	273	22	9,507	3·89	370·0	350	Mature	316, 365 ..	Willow Park Banker 3rd
Parkes, E. F., Merton, Jersey (3).										
Irona Dream Song ..	Vol. 13	150	..	1,980	4·44	87·9	230	Jr. 2	.. ..	Irona Dreamer
Irona Janet	Vol. 30	250	4	2,792	5·40	150·7	230	Jr. 2	.. ..	Irona Dreamer
Irona Petal's Margaret ..	81900	251	4	3,650	5·17	188·8	250	Sr. 2	266 ..	Victoria Dandy Boy
Pattison, G., Tongala, Ayrshire (1).										
Willow Park Jeanette ..	31007	273	12	9,954	4·21	418·7	350	Mature	343, 393, 367, 343, 345	Fulham Beam
Payne, A. E. T., Lilydale, Guernsey (9).										
Yarraview Calm ..	11954	273	22½	6,969	5·35	373·1	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Ceres 2nd ..	11955	273	25	6,882	5·27	362·4	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Clara's Fashion	9766	273	18	6,260	5·19	324·8	250	Sr. 2	309 ..	Honoria's Benefactor (Imp.)
Yarraview Le Mode ..	8225	273	37½	15,000	6·50	975·8	350	Mature	563, 738, 816	Camilla's Majestic 3rd of Maple Lodge
Yarraview Levity ..	9781	273	19	8,355	4·92	411·0	290	Sr. 3	348, 370 ..	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Royal ..	6642	273	15	6,858	4·30	295·2	350	Mature	431, 385, 314, 369	Yarraview Sunrise
Yarraview Ruetta ..	11980	273	20	6,965	4·99	347·4	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Secret ..	11981	273	19½	6,587	4·96	326·4	230	Jr. 2	.. ..	Sun Rose of Maple Lodge (Imp.)
Yarraview Souvenir ..	3568	273	26	7,949	5·11	406·1	350	Mature	517, 290, 358, 424, 467	Camilla's Majestic of Maple Lodge (Imp.)

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Phillips, J. H., Swan Hill, Jersey (3).										
Ryelands Brooklet ..	83819	273	5	7,035	5·52	388·2	290	Sr. 3	290, 345 ..	Banaview Master
Ryelands Golden Morn ..	C.R.	273	14	5,399	5·07	273·5	230	Jr. 2	.. ..	Ryelands Fashion Plate
Ryelands Wynette ..	83827	240	4	4,710	4·92	231·5	270	Jr. 3	194 ..	Banaview Master
Powell, T. S., Mansfield, Jersey (5).										
Carellen Fancy Madeira ..	80672	273	12	5,106	5·65	288·6	230	Jr. 2	.. ..	Werribee Planet
Carellen Golden Duchess ..	70638	273	12	7,680	4·62	354·7	270	Jr. 3	345, 380 ..	Werribee Madeira's Ace
Carellen Lady Madeira ..	70639	273	14	7,563	5·64	426·5	310	Jr. 4	408, 476 ..	War Valour (Imp.)
Monterey Melody's Mascot	58530	240	4	9,285	4·96	460·1	350	Mature	420, 398, 547, 583, 595, 575	Rosecliffe Mariposa's Master
Navuloa Master's Encore ..	68279	273	19½	9.003	4·96	446·6	350	Mature	386, 363, 487, 462	Werribee Grandmaster
Read, Estate of the late J. D., Springhurst, Jersey (3).										
Springhurst Napoleonette Tomato	78936	273	15	6,191	6·80	420·8	250	Sr. 2	.. ..	Springhurst Tomato's Pride
Springhurst Philodora's Aconite	73927	273	12	6,706	5·23	350·4	270	Jr. 3	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Successor's Narcissus	73933	273	16	7,335	4·90	359·5	290	Sr. 3	370 ..	Springhurst Glad Successor
Reid, Miss B. B., Bundoora, Jersey (13).										
Jubilee Dombeya ..	72005	273	13	4,054	5·08	206·1	350	Mature	289 ..	Jubilee Richlight
Jubilee Lavandula ..	72012	273	9	4,154	5·40	224·3	330	Sr. 4	205 ..	Werribee Stylish Masterpiece
Jubilee Lilipilli	67239	273	9½	4,022	4·99	200·6	350	Mature	287 ..	Werribee Stylish Masterpiece
Jubilee Lolium	Vol. 30	273	10	3,300	4·43	146·1	230	Jr. 2	.. ..	Jubilee Richlight
Jubilee Lovemist ..	Vol. 30	273	16	4,176	4·61	192·7	230	Jr. 2	.. ..	Jubilee Lanelight
Jubilee Thrift	82000	273	17	5,313	4·52	240·1	250	Sr. 2	.. ..	Werribee Stylish Masterpiece
Jubilee Walnut	57878	273	7	5,285	5·32	281·4	350	Mature	340 ..	Jubilee Whalelight
Jubilee Westringia ..	67242	273	5	4,893	4·53	221·8	350	Mature	286 ..	Werribee Stylish Masterpiece
Jubilee Wheat	67243	273	12	6,174	4·82	297·3	350	Mature	367 ..	Werribee Stylish Masterpiece
Jubilee White Rose ..	67244	273	15	6,153	5·09	313·3	350	Mature	.. ..	Jubilee Richlight
Jubilee Whitlavia ..	Vol. 30	273	10	3,182	5·78	183·8	230	Jr. 2	.. ..	Jubilee Landlight
Jubilee Winterflower ..	Vol. 30	273	11	3,515	5·84	205·2	230	Jr. 2	.. ..	Jubilee Landlight
Jubilee Lentil	Vol. 30	273	12	4,234	5·20	220·2	230	Jr. 2	.. ..	Werribee Stylish Masterpiece
Richardson, W. S., Bacchus Marsh, Jersey (2).										
Neerod Bright Eyes ..	73101	273	15	5,978	6·01	359·4	350	Mature	358 ..	Mornmoot Montrose
Willis Vale Colonel's Pansy	64921	273	14	5,292	5·49	290·3	350	Mature	323, 355 ..	Willis Vale Mystic Colonel
Ronalds, O., and Son, Tarago, Jersey, (1).										
Arlington Clementine ..	70015	273	15	7,847	5·39	423·1	290	Sr. 3	428, 431 ..	War Valour (Imp.)
Ross, D. M., Croydon, Dairy Shorthorn (6).										
Willow Park Blush 13th ..	1643D	273	4	7,002	3·90	273·2	270	Jr. 3	335 ..	Wicklesham Lord Barrington 5th (Imp.)
Trenavin Park Clarabelle ..	C.C.	273	9	5,706	4·04	230·4	230	Jr. 2	.. ..	Willow Park Lord Barrington 21st
Willow Park Countess 33rd	1664D	273	4	5,502	4·05	223·0	310	Jr. 4	276, 235 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 35th	1512C	273	6	7,599	3·77	286·4	290	Sr. 3	320 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Dainty 16th	1518C	273	12	7,223	3·65	263·9	310	Jr. 4	271, 355 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 46th	1527C	273	16	6,985	3·94	275·2	270	Jr. 3	.. ..	Anderson Imperial Cran 6th (Imp.)
St. Joseph's Home, Ballarat, Jersey (3).										
Lipook Hazel	72458	273	12	5,843	5·28	308·3	350	Mature	291, 412, 380	Marfield Joker
St. Joseph's Design's Patricia	C.R.	252	4	3,777	5·62	212·4	270	Jr. 3	326 ..	Selsey Design's Standard
St. Joseph's Patricia 2nd ..	83852	245	4	6,453	4·84	312·5	270	Jr. 3	341 ..	Lipook Mariner
Shearman, A. and W., Darnum, Jersey (1).										
Darnum Park Starbright 4th	C.R.	273	13	5,841	6·28	366·7	250	Sr. 2	.. ..	Darnum Park Lord Starbright 2nd

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Smith Bros., Mirboo North, Jersey (8).										
Sylvan Hill Bluebell ..	50735	273	N.C.K.	7,103	4·75	337·4	350	Mature	345, 321, 405, 396, 347, 347, 417	Somerville Heir Apparent
Sylvan Hill Charm 2nd ..	74045	273	N.C.K.	6,636	5·43	360·4	350	Mature	296, 315, 332	Glen Iris Bow Bells
Sylvan Hill Duchess ..	50736	273	N.C.K.	8,631	5·01	432·0	350	Mature	409, 350, 427, 511, 413, 489, 436, 414	Somerville Heir Apparent
Sylvan Hill Joyful ..	50738	273	N.C.K.	6,826	5·32	362·9	350	Mature	345, 337, 397, 471, 455, 438, 384, 402	Somerville Heir Apparent
Sylvan Hill Lily 3rd ..	64409	273	N.C.K.	4,807	6·04	290·2	350	Mature	316, 393, 130, 412, 393	Glen Iris Bow Bells
Sylvan Hill Mercedes ..	79057	240	N.C.K.	4,920	4·59	225·9	310	Jr. 4	156, 185 ..	Glen Iris Bow Bells
Sylvan Hill Molly's Bell ..	64412	240	N.C.K.	5,579	4·98	277·9	350	Mature	252, 328, 347, 347, 359	Glen Iris Bow Bells
Sylvan Hill Thelma 2nd ..	69193	273	N.C.K.	6,678	5·21	348·2	350	Mature	258, 358 ..	Glen Iris Bow Bells
Smith, R. W., and Son, Murraydale, Friesian (6).										
Wattle Bank Colantha Maggie	Vol. 15	273	16	9,310	3·14	292·0	230	Jr. 2	.. ..	Elmar Iona Patch
Wattle Bank Fairy 3rd ..	6111	273	7	8,903	2·82	251·5	330	Sr. 4	331, 394 ..	Wattle Bank Segis De Kol
Wattle Bank Mercedes Queen	6114	273	15	12,403	3·13	388·7	350	Mature	329, 403, 414	Hengest Lizzie Segis
Wattle Bank Primrose 4th	Vol. 15	273	30	14,888	3·01	447·6	310	Jr. 4	455, 444 ..	Wattle Bank Segis De Kol
Wattle Bank Segis Jessie ..	6123	273	22	12,831	3·14	403·2	350	Mature	427, 499, 428	Hengest Lizzie Segis
Wattle Bank Tulip ..	Vol. 15	273	5	8,310	3·28	272·6	270	Jr. 3	315 ..	Wattle Bank Oakview Segis
Stephens, Dr. F., Vermont, Guernsey (4).										
Vermont Fay	8003	273	18	7,034	4·72	332·1	330	Sr. 4	304, 298 ..	Vermont Prince Johnnie
Vermont Henrietta ..	9561	273	12	9,429	4·81	453·1	350	Mature	164, 274, 330	Roads End Henry
Vermont May	9563	273	26	8,676	4·36	377·9	310	Jr. 4	.. ..	Vermont Prince Johnnie
Yarraview Cynthia ..	11957	273	17	7,019	5·31	372·6	230	Jr. 2	.. ..	Sun Rose of Maple Lodge (Imp.)
Stirling, H. V., Meade, Jersey (3).										
Coimbra Silver Queen 3rd	75691	240	4	5,227	4·44	232·3	310	Jr. 4	250, 279 ..	Coimbra Airman
Banyule Ishta	51650	273	N.C.K.	7,334	5·18	380·0	350	Mature	347, 374, 329, 422, 379	Banyule Pitman
Coimbra Ishta 7th ..	Vol. 30	273	N.C.K.	3,969	5·85	232·2	230	Jr. 2	.. ..	Banyule Statoscope
Tandberg, G., and Son, Warragul, Illawarra Shorthorn (8).										
Donrobin Bangle ..	10268	210	4	5,932	3·75	222·2	350	Mature	326 ..	Premier 2nd of Kurrawang
Douglas Vale Linda ..	Vol. 9	273	10	5,167	4·25	219·6	230	Jr. 2	.. ..	Numbawarra Maiden's Sultan
Myrtleville Dora 3rd ..	Vol. 9	273	8	6,716	4·03	270·8	230	Jr. 2	.. ..	Parkview Combination
Myrtleville Myrtle 4th ..	Vol. 9	273	12½	6,285	4·57	287·0	230	Jr. 2	.. ..	Parkview Combination
Veresdale Bush Bee ..	28351	273	17	7,401	3·90	288·8	330	Sr. 4	264, 532, 372	Ovendale Pearl's Renown
Veresdale Peach 2nd ..	33746	273	12	6,060	4·41	267·0	250	Sr. 2	290 ..	Numbawarra Maiden's Sultan
Veresdale Poppy ..	28368	240	4	8570	3·66	313·9	350	Mature	245, 357, 308	Veresdale Diamond
Veresdale Royal	33751	210	4	6,495	3·91	253·7	270	Jr. 3	254 ..	Numbawarra Maiden's Sultan
Teychenne and Ducret, Wesburn, Guernsey (2).										
Melbourne Golden Babette	4461	273	15	10,803	4·25	459·2	350	Mature	432 ..	Woodlands Fleur-de-lys (Imp.)
Warrawong Warrena ..	8038	273	13	8,064	5·57	448·9	330	Sr. 4	437 ..	Nundorah Climax
Thomas and Taylor, Hamilton, Ayrshire (1).										
Jennewar Nora	33751	273	15	9,064	4·33	392·9	310	Jr. 4	404, 530 ..	Denbigh Ace
Tomasetti, B. G., Drouin West, Ayrshire (8).										
Alvaston Audrey ..	31922	273	17	8,502	4·04	343·3	350	Mature	203, 284, 303, 338	Cathcart Masterpiece
Emoh Ruo Dallas ..	C.R.	273	11	6,462	3·40	219·4	230	Jr. 2	.. ..	Emoh Ruo Excellent
Glencorren Annette ..	C.R.	273	13	5,742	4·95	284·3	230	Jr. 2	.. ..	Glenfalloch Pilot
Glencorren Ellen ..	C.R.	273	9	4,664	4·50	210·1	230	Jr. 2	.. ..	Glencorren Quid
Glencorren Gay Girl ..	35439	273	22	9,687	3·92	379·7	270	Jr. 3	312 ..	Glenfalloch Pilot
Glencorren Greta ..	35440	273	14	6,384	4·94	315·2	230	Jr. 2	.. ..	Glencorren Future
Glencorren Myra ..	C.R.	273	15	5,802	4·00	232·0	230	Jr. 2	.. ..	Glenfalloh Pilot
Glencorren Vim	C.R.	273	10	4,950	4·13	204·2	230	Jr. 2	.. ..	Glencorren Quid
Trevaskis, F. T., Tongala, Jersey (2).										
Ballara Dainty 3rd ..	60443	273	N.C.K.	6,369	5·95	378·7	350	Mature	263, 274, 365	Kyora Dream's Gadget 2nd
Grovelea Ranger's Bee ..	66860	180	N.C.K.	5,715	4·44	253·7	350	Mature	214, 338 ..	Orphanage Ranger

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Turner, A. J., Yannathan, Jersey (2).										
Finchley Nasturtium 11th	86351	273	N.C.K.	5,219	5·78	301·5	270	Jr. 3	301 ..	Finchley Vasilika's Masterpiece
The Wattles Petal 8th ..	74167	273	N.C.K.	5,829	5·23	305·0	310	Jr. 4	309, 296 ..	The Wattles Silver Gamboge
Tyssen, C. J., Warragul, Jersey (7).										
Hylsbroke Air Lady 2nd ..	53236	273	12	6,606	4·89	322·9	350	Mature	303 ..	Latrobe Silverminer
Hylsbroke Air Lady 3rd ..	62177	273	9	6,762	4·80	324·3	350	Mature	410, 370 ..	Latrobe Silverminer
Hylsbroke Gold Dust ..	57734	240	4	7,665	5·28	404·9	350	Mature	467, 453 ..	Latrobe Starjoy
Hylsbroke Goldfinch 2nd ..	71835	273	14½	8,819	4·65	409·7	350	Mature	399, 413 ..	Latrobe Airplane
Hylsbroke Jolly Lassie 7th	Vol. 30	273	13½	6,611	5·60	369·9	250	Sr. 2	.. ..	The Wattles Young Gamboge
Hylsbroke Joybell 6th ..	Vol. 30	240	4	4,425	5·82	257·4	270	Jr. 3	.. ..	The Wattles Young Gamboge
Hylsbroke Maybell ..	Vol. 30	273	12	7,461	4·46	332·7	350	Mature	.. ..	Latrobe Starjoy
Unthank, Miss Freda, Hastings, Jersey (3).										
The Hollies Pearl ..	84151	273	N.C.K.	5,955	5·37	319·7	350	Mature	527 ..	St. John's Jewel 3rd's Investor
The Hollies Ranee ..	79157	180	N.C.K.	4,290	5·66	242·9	310	Jr. 4	441 ..	Windrest Ranee's Lad
The Hollies Seaweed 3rd ..	84153	273	N.C.K.	5,358	5·08	272·0	250	Sr. 2	259 ..	The Hollies Chief
Vaughan Bros., Girgarre, Jersey (11).										
Lynroy Dainty Dell ..	Vol. 30	180	N.C.K.	2,505	5·85	146·6	230	Jr. 2	.. ..	Carellen Madeira's Pride
Lynroy Fancy 4th ..	62864	240	N.C.K.	5,595	5·18	290·0	350	Mature	382, 268, 374, 465, 416, 400	Werribee Laverock
Lynroy Fay	67740	273	N.C.K.	5,752	5·18	298·2	350	Mature	283, 443, 426, 392	Werribee Laverock
Lynroy Glade	82556	273	N.C.K.	6,054	6·47	391·6	290	Sr. 3	321 ..	Werribee Laverock
Lynroy Glad Eye ..	67741	240	N.C.K.	5,505	5·26	289·8	350	Mature	331, 448, 505	Werribee Laverock
Lynroy Gladys 6th ..	72572	150	N.C.K.	4,620	5·42	250·6	350	Mature	351, 490 ..	Werribee Laverock
Lynroy Heatherbelle ..	C.R.	273	N.C.K.	7,415	5·12	380·0	250	Sr. 2	.. ..	Werribee Laverock
Lynroy Mona	Vol. 30	273	N.C.K.	6,978	6·23	434·9	250	Sr. 2	484 ..	Werribee Laverock
Lynroy Nancy Belle 3rd ..	Vol. 30	273	16	4,698	5·83	274·0	230	Jr. 2	.. ..	Lynroy Pixie's Prince
Lynroy Trixie	Vol. 30	273	10	4,507	5·46	246·3	230	Jr. 2	.. ..	Lynroy Pixie's Prince
Lynroy Vanity Fair ..	82559	273	N.C.K.	7,151	5·18	370·7	250	Sr. 2	376 ..	Werribee Laverock
Wade, W. J., Stratford, Jersey (3).										
Inverbroom Eminent's Empress	Vol. 30	273	N.C.K.	5,270	5·44	286·7	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Boomerang 4th
Inverbroom Ruby's Eminent	81877	273	14	5,817	5·20	302·3	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Boomerang 4th
Inverbroom Silvermine's Marie	44392	273	N.C.K.	7,193	4·96	356·9	350	Mature	429, 455, 496, 476, 589, 478, 402	Economist of Eveley
Walker, C. S., Swan Hill, Friesian (2).										
Warwick Maggie Walker ..	6106	273	N.C.K.	14,889	3·81	567·4	350	Mature	272, 383, 618, 541, 504	Hengest Matador Walker
Warwick Netherland Empress	Vol. 15	273	N.C.K.	9,924	3·11	308·6	290	Sr. 2	242 ..	Hengest Matador Walker
Walker, C. S., Swan Hill, Jersey (22).										
Clarendon Eyre Love Lies 7th	65948	273	N.C.K.	8,291	4·71	390·5	350	Mature	366, 417, 478, 513	Clarendon Eyre Ruddigore 5th
Warwick Augustus Marie 9th	79520	273	N.C.K.	8,396	4·68	393·0	310	Jr. 4	306, 379 ..	Leven Brae A'do Masterpiece
Warwick Beauty 6th ..	64825	273	N.C.K.	5,964	4·76	284·0	350	Mature	225, 306, 399, 344, 364	Warwick Golden Lad
Warwick Beauty 9th ..	74448	240	N.C.K.	6,480	4·08	322·8	330	Sr. 4	358, 306 ..	Warwick Golden Lord
Warwick Bellbird 7th ..	Vol. 30	273	N.C.K.	6,029	5·39	324·8	270	Jr. 3	278 ..	Leven Brae A'do's Masterpiece
Warwick Cello 3rd ..	Vol. 30	273	N.C.K.	6,912	5·24	361·9	270	Jr. 3	337 ..	Leven Brae A'do's Masterpiece
Warwick Cream Stockings 3rd	69628	273	N.C.K.	6,783	5·22	354·4	350	Mature	314, 411, 425, 446	Warwick Golden Lord
Warwick Design's Marie ..	Vol. 30	273	N.C.K.	6,572	4·77	313·2	230	Jr. 2	.. ..	Selsey Design's Foremost
Warwick November's Marie	Vol. 30	273	N.C.K.	4,686	4·75	222·7	230	Jr. 2	.. ..	Navua Wonderful Star
Warwick Polly 2nd ..	46642	273	N.C.K.	6,548	4·84	317·2	350	Mature	227, 324, 324, 454, 439, 452, 438, 375	Preston Star King
Warwick Polly 4th ..	59945	273	N.C.K.	6,537	4·83	315·5	350	Mature	265, 329, 372, 338, 405, 417	Glen Iris Golden Lord
Warwick Polly 6th ..	79528	273	N.C.K.	7,167	4·75	340·7	350	Mature	336, 466, 462, 422	Glen Iris Golden Lord
Warwick Polly 12th ..	79529	273	N.C.K.	7,812	4·85	378·8	310	Jr. 4	319, 395 ..	Warwick Golden Lord
Warwick Polly 20th ..	Vol. 20	273	N.C.K.	5,740	5·26	302·1	230	Jr. 2	.. ..	Leven Brae A'do's Masterpiece
Warwick Polly 22nd ..	Vol. 30	273	N.C.K.	6,120	4·59	280·9	230	Jr. 2	.. ..	Warwick Masterstroke

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields at Butter Fat.	Sire.
Walker, C. S., Swan Hill, Jersey—*continued.*										
Warwick Princess 15th ..	Vol. 30	273	N.C.K.	6,011	4·95	297·4	230	Jr. 2	.. ..	Warwick Masterstroke
Warwick Princess 16th ..	C.R.	257	N.C.K.	4,942	5·00	247·3	230	Jr. 2	.. ..	Selsey Design's Foremost
Warwick Samare's Design ..	Vol. 30	273	N.C.K.	6,987	5·30	370·0	230	Jr. 2	.. ..	Selsey Design's Foremost
Warwick Samare's Rosebud	Vol. 30	273	N.C.K.	4,470	6·21	277·4	230	Jr. 2	.. ..	Selsey Design's Foremost
Warwick Samare's Roseleaf	Vol. 30	273	N.C.K.	5,879	4·85	285·2	230	Jr. 2	.. ..	Selsey Design's Foremost
Warwick True Love 2nd ..	Vol. 30	273	N.C.K.	5,639	5·45	307·2	230	Jr. 2	.. ..	Navua Wonderful Star
Weir View Golden Design 2nd	59968	273	N.C.K.	8,990	5·05	454·3	350	Mature	323, 477, 473, 370, 425	Weir View Golden Duke
Waterhouse, H. W., and Son, Pakenham, Jersey (4).										
Navuloa La Stralia ..	68277	273	18½	8,841	5·17	456·9	350	Mature	380, 448, 430	Staghorn Laburnum's Masterpiece
Navuloa Laburnum's Lady	83100	273	15	5,381	4·65	250·0	230	Jr. 2	.. ..	Staghorn Laburnum's Masterpiece
Navuloa Laburnum's Princess	78043	273	15	5,800	5·68	329·3	250	Sr. 2	290 ..	Staghorn Laburnum's Masterpiece
Navuloa Master's Stralia ..	49808	273	12	8,572	5·00	428·3	350	Mature	454, 450, 461	Werribee Grandmaster
Whelpton, B., Whittlesea, Jersey (4).										
Coodardy Fuchsia ..	Vol. 30	273	..	5,491	4·72	259·2	270	Jr. 3	269 ..	Werribee Centurion
Crystal Brook Bloom ..	47798	273	6	7,788	4·95	385·8	350	Mature	486, 430 ..	Crystal Brook Noble
Hemswell Winsome 2nd ..	C.R.	273	..	5,346	4·39	234·8	230	Jr. 2	.. ..	Windrest Dreaming Pioneer
Jubilee Erythrina ..	67235	273	11	4,799	6·12	293·7	350	Mature	373 ..	Werribee Stylish Masterpiece
Williams, Estate of the late F. A., Bamawm Extension, Jersey (13).										
Bamawm Daisy Bell 2nd ..	80119	273	N.C.K.	8,397	6·12	514·2	270	Jr. 3	437 ..	Bamawm Mystic Lad
Bamawm Fancy Garenne 3rd	Vol. 30	273	N.C.K.	5,181	6·30	326·2	230	Jr. 2	.. ..	Bamawm Ruth's Sultan
Bamawm Gem 2nd's Fancy	80122	273	N.C.K.	7,388	5·53	408·8	270	Jr. 3	406 ..	Bamawm Mystic Lad
Bamawm Fancy Madeira ..	75051	273	N.C.K.	7,857	5·94	466·7	290	Sr. 3	352, 441 ..	Bamawm Bonnie Boy
Bamawm Lassie Belle ..	Vol. 30	273	N.C.K.	6,252	6·25	390·6	290	Sr. 3	273 ..	Bamawm Bonnie Bugler
Bamawm Madeira's Lass ..	Vol. 30	273	N.C.K.	6,783	5·80	393·3	230	Jr. 2	.. ..	Mornmoot War Hero
Bamawm Madeira's Rosalie	Vol. 30	273	N.C.K.	4,515	5·96	269·0	230	Jr.2	.. ..	Mornmoot War Hero
Bamawm Mayflower ..	47101	273	N.C.K.	6,926	5·42	375·3	350	Mature	390, 450, 402, 448, 572	Bamawm Leon
Bamawm Mistress Peggy ..	56238	273	N.C.K.	7,371	5·02	370·3	350	Mature	373, 422, 344, 507, 519, 402	Bamawm Bonnie Boy
Bamawm Pretty Lady ..	56239	273	N.C.K.	9,147	5·75	525·6	350	Mature	366, 329, 313, 634, 557, 495	Bamawm Master Gaypiece
Bamawm Princess Madeira	Vol. 30	273	N.C.K.	4,370	5·89	257·3	230	Jr. 2	.. ..	Mornmoot War Hero
Bamawm Princess Noella ..	65323	273	N.C.K.	7,634	4·90	373·7	350	Mature	328, 472, 391 438	Bamawm Master Gaypiece
Bamawm Ruth	60474	273	N.C.K.	9,786	4·77	466·5	350	Mature	402, 492, 526, 535, 476	Bamawm Leon
Wilson, A., Port Fairy, Ayrshire (10).										
Jennewar Pearline ..	32628	210	4	3,765	3·71	139·7	350	Mature	228, 233 ..	Denbigh Ace
Lough View Balm ..	33866	210	4	3,870	5·01	194·0	350	Mature	266 ..	Carracoorte Bobby
Lough View Balm 3rd ..	35680	273	9	4,077	5·07	206·9	230	Jr. 2	.. ..	Lough View Bell Lad
Lough View Blanche ..	33867	273	22½	5,972	4·87	290·8	350	Mature	273 ..	Carracoorte Bobby
Lough View Brownie ..	32778	273	6	5,223	4·34	226·6	350	Mature	196, 289 ..	Carracoorte Bobby
Lough View Fairy ..	35083	273	12	4,176	4·15	173·3	230	Jr. 2	.. ..	Lough View Bell Lad
Lough View Loretta ..	34861	273	8	5,262	4·19	220·5	270	Jr. 3	207 ..	Lough View Bernard
Lough View Petunia ..	31623	210	4	4,665	3·39	158·0	350	Mature	237, 229, 253	Carracoorte St. Bernard
Rivery Park Radio ..	35796	273	11	6,933	4·55	315·7	350	Mature	.. ..	Rivery Park Midnight
Stoneleigh Fairy 2nd ..	33081	273	9	6,957	3·64	253·2	350	Mature	202, 275 ..	Strathkelar Pride